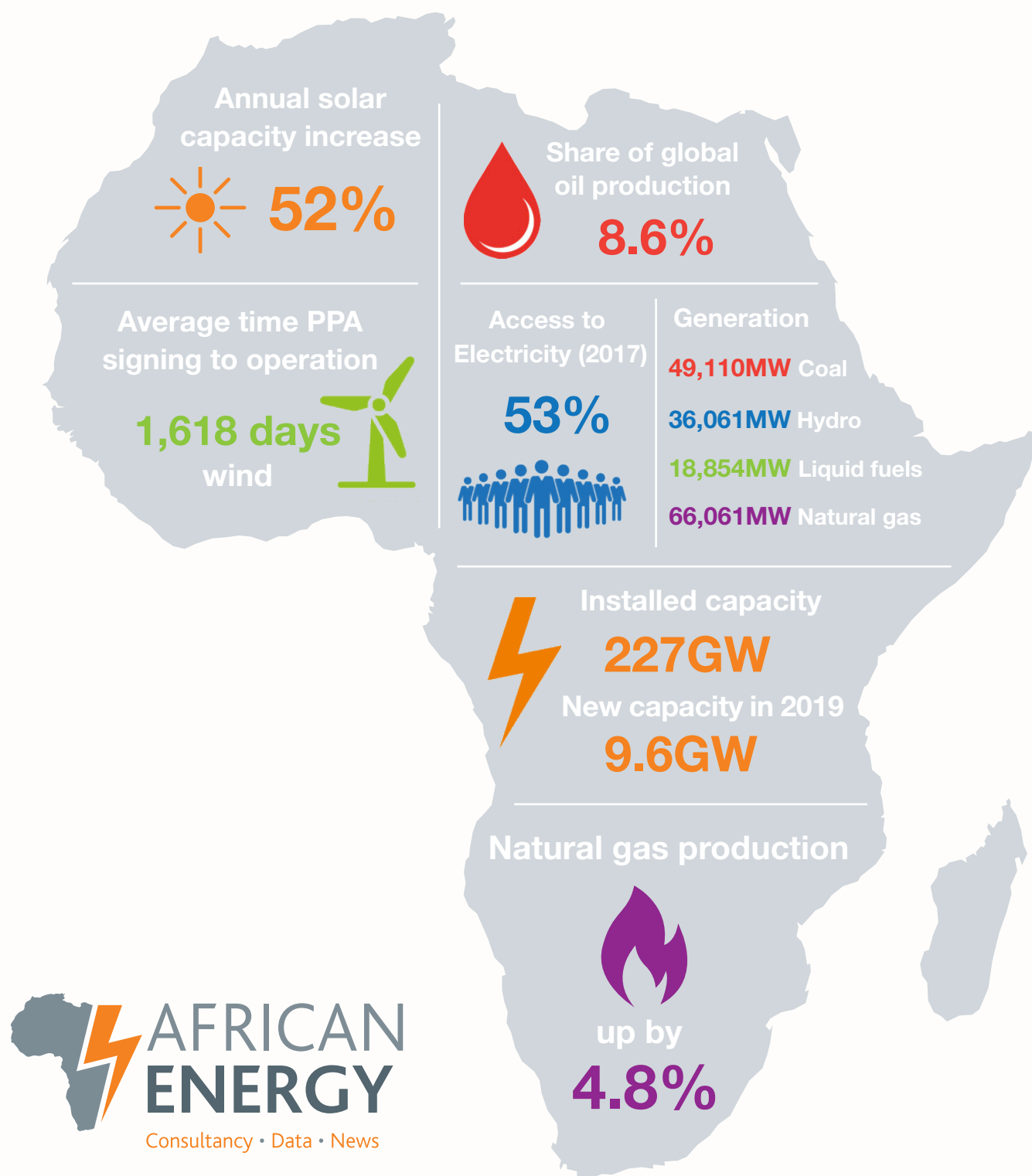


African Energy Atlas





Consultancy • Data • News

African Energy Atlas 2020/2021

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About the Atlas

The power maps in the *African Energy Atlas 2020/2021* are informed by *African Energy Live Data*, an industry-leading database with detailed entries on more than 6,500 power generation plants and projects. The Atlas is necessarily constrained in the number of projects that can be displayed. For more information please see the following note on power definitions and visit the *African Energy* website, where you may explore the interactive Live Data map.

Cartographer David Burles has used a wide variety of other sources to craft the maps but while considerably more open source material is available to inform our maps and graphics than when the *Atlas* was first published in 2007, huge gaps remain to even the most fundamental data sets.

We welcome positive and negative feedback, and data suggestions to enrich forthcoming editions. Please contact publishing director Nick Carn (nick@africa-energy.com).

Power definitions

Status:

Operating: plants that are producing electricity, even if this is substantially below maximum capacity.

Construction: building work is ongoing at the site.

Planned: any project which has not yet begun construction. This includes projects which are at a very early stage of development, such as identified hydro sites, as well as those which are much more advanced. The data tables shown under the maps refer only to projects with a planned commercial operation date of 2025 or earlier.

Fuels:

Natural gas: any plant fuelled by natural gas, whatever the source, including both LNG and pipeline gas.

Liquid fuels: includes all fuel oils, crude oils, shale oil and liquid gases.

Coal: technologies using coal as the original source of energy.

Nuclear: refers to technologies utilising the energy contained within the atomic structure of matter, including both fission and fusion.

Hydroelectricity: any technology based on the movement or weight of water from a river or reservoir, including pumped storage.

Solar: any technology producing electricity using energy from the sun.

Wind: any technology producing electricity using energy from the wind.

Geothermal: any plant using underground temperature differentials to produce power.

Biomass: technology using organic matter as a feedstock, including biogas technologies.

Other: includes combinations of fuels and hybrids where the individual capacities are not known, as well as ocean technologies, coal bed methane and industrial process heat.

Cover illustration

Power generation data is taken from *African Energy Live Data* and is for end 2019, except average time from PPA signing to operation, which is based on all available information in the database.

Electricity access data is sourced from the SEforALL/World Bank database.

Oil and gas data is for 2018 and taken from the BP Statistical Review of World Energy, June 2019.

FOCUS

Introduction	4
On-grid generation capacity, Access to electricity	5
African Energy Live Data	6
Roads, railways, ports, airports	12
Climate, population, income, fossil fuels, power generation	13
Finance	14
Political risk ratings	15
Regional groupings	16
Economic Africa	17
Sovereign ratings	17
Economic indicators by country	18
Key energy trends	20

POWER

National power companies	21
Regional power pools	21
Trends	22

North Africa

Morocco	24
Algeria	25
Tunisia	26
Libya	27
Egypt	28
The Mediterranean Basin	29

Sub-Saharan Africa

West African Power Pool	30
Southern Africa Power Pool	32
Senegal, Mauritania, The Gambia, Guinea-Bissau	33
Guinea, Sierra Leone, Liberia, Cape Verde	34
Côte d'Ivoire	35
Ghana, Togo, Benin	36
Nigeria	37
Mali, Burkina Faso, Niger	38
Cameroon, Central African Republic, Chad	40
Rep. of Congo, Gabon, Equatorial Guinea, STP	41
Central African Power Pool	42
Democratic Republic of Congo	43
Sudan, South Sudan	44
Ethiopia, Eritrea, Djibouti, Somalia	45
Uganda	46
Kenya	47
Rwanda, Burundi, Malawi	48
Eastern Africa Power Pool	48
Tanzania	49
Angola	50

Namibia	51
Zambia	52
Zimbabwe	53
Botswana	54
Mozambique	55
South Africa, eSwatini, Lesotho	56
Madagascar, Indian Ocean islands	58

UPSTREAM OIL AND GAS

National oil and gas companies and state regulators	59
Opec, GECF, EITI	59

North Africa

Morocco	60
Algeria	61
Tunisia	62
Libya	64
Egypt	65

Sub-Saharan Africa

Mauritania, Senegal, The Gambia	69
Guinea, Guinea-Bissau, Sierra Leone, Liberia	71
Mali, Burkina Faso, Niger, Chad, Central African Rep.	72
Côte d'Ivoire	73
Ghana, Togo, Benin	74
Cameroon	75
Nigeria	76
Niger Delta	77
Equatorial Guinea, São Tomé and Príncipe	78
Gabon	80
Republic of Congo	81
Democratic Republic of Congo	82
Sudan, South Sudan	83
Ethiopia, Eritrea, Djibouti	84
Somalia	85
Angola	86
Uganda, Rwanda, Burundi	87
Kenya	89
Tanzania	90
Zambia, Zimbabwe, Malawi, Botswana	91
Mozambique, Ruvuma Basin	92
Namibia	93
South Africa	94
Madagascar, Indian Ocean	95

DOWNSTREAM

Primary energy demand projections	98
Oil refineries, CTL and GTL plants	99
Gas development and commerce	100

Introduction

Economies battle to accommodate carbon transition amid uncertainty

Investors are being asked to provide unprecedented funding to help Africa tackle climate change and transition towards a post-carbon economy. The *African Energy Atlas 2020/2021* seeks to provide an overview of trends in infrastructure and resources, along with an idea of some of the many policy challenges confronting the continent

The outlook for Africa was unusually positive when the last edition of the *African Energy Atlas* was published in 2018. “Peaceful political transitions, an upturn in natural resources prices and a broader range of investors entering electricity supply and other industries all point to the emergence of a more dynamic, mature continental economy,” the introduction asserted, marking the *Atlas*’s second decade of publication. Maps and graphics in this new edition similarly chart positive trends in politics, economic management, technological change and sustainable investment – not least the number of renewable energy schemes now under way – but even before the Covid-19 pandemic locked down the global economy, the trends recorded in *Atlas 2020/2021* were far from a celebration of good news across the continent.

Africa’s needs remain huge and daunting: the African Development Bank calculates that upgrading the continent’s infrastructure needs some \$130bn–\$170bn/yr; the financing gap is \$68bn–\$108bn/yr (see Finance). There has been an upturn in private equity and some other investment, but they are nowhere near the levels that can start to address infrastructure shortfalls and lack of access to sustainable clean energy.

Governance remains spotty, with some advances but also backward steps. Benin and Zambia were among the first countries to replace autocracy with democracy in 1991, as a bonus from the end of the Cold War, but are now ranked only ‘partly free’ by Freedom House. Indeed, the US advocacy group now ranks only five African polities in its highest ‘free’ category; by this metric some 20 states are still ‘not free’ at all.

Short-term problems may be exacerbated by underlying weaknesses. As *Atlas 2020/2021* was published, the coronavirus epidemic was spreading worldwide, while crude oil prices had hit record low levels, below even those of the 2007–08 global financial crisis. Coronavirus highlights global vulnerabilities that can floor interconnected economies. Even if Europe and the US have erected ever more barriers to migration, the outbreak has shown how walls alone cannot solve global problems.

Africa’s rural exodus has created megacities like Lagos, Cairo and Kinshasa, whose populations live between extreme wealth and grinding poverty. Providing adequate services has become a defining political issue of the decade, as urban and peri-urban populations demand higher standards of education, health and access to energy from often creaking state bodies.

Enlightened governments are seeking to rise to this challenge, by accelerating moves to create more investor-friendly and

innovative environments. Countries like Ghana and Kenya have dramatically raised access levels; Egypt, Morocco and South Africa (at least until its governance crisis) have developed structures to attract investment in solar power and other renewable energies. Mozambique’s efforts to work with IOCs mean its natural gas exports are set to take off while its northern neighbour Tanzania’s resources remain in the ground.

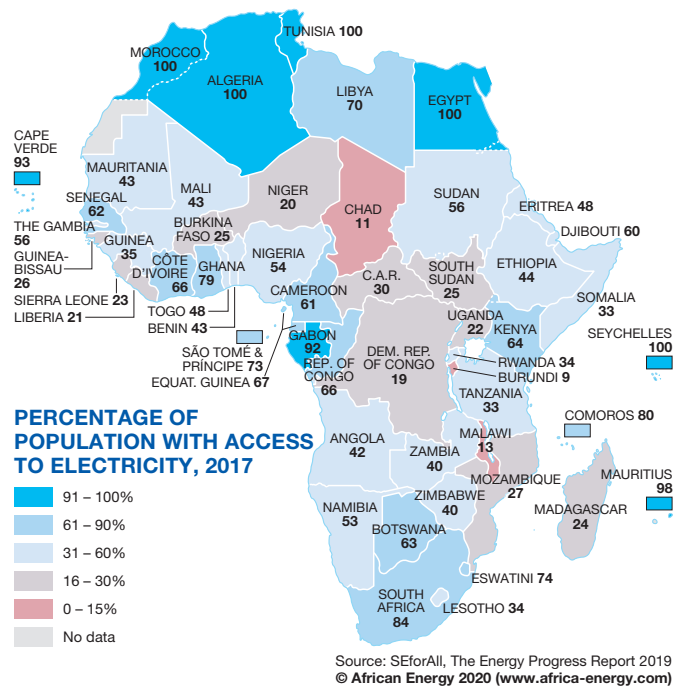
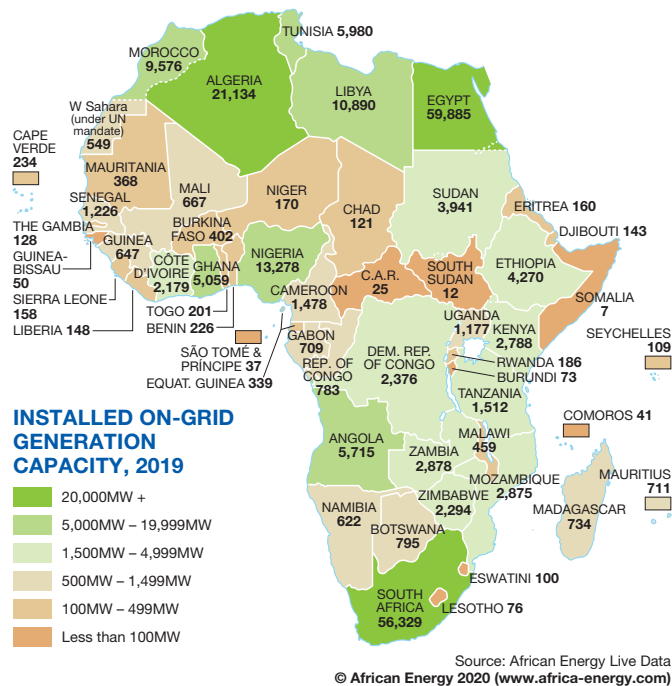
Governance moves

The trend towards improved governance has continued its slow upward trajectory. Some of Africa’s old-school tyrants have departed – Zimbabwe’s Robert Mugabe died in 2019 and Egypt’s Hosni Mubarak in February 2020 – and a few leaders have been elected without drawing on traditional constituencies, such as Tunisia’s President Kais Saied. The removal of Jacob Zuma and his replacement as president by Cyril Ramaphosa helped stem a disastrous trend towards state capture in South Africa. In Nigeria, President Muhammadu Buhari can claim a few wins against the kleptocracy that so undermines Africa’s most populous country.

But much remains to be done: South Africa is a better place after Zuma, but Ramaphosa has yet to reverse a decline that has taken Eskom from being one of the world’s top four power companies to the edge of collapse. Nigerian reforms have failed to make any impact on the oil industry and other drivers of extreme graft. A number of elderly rulers hang on after decades in power. While francophone West African countries are looking to mark their improving economic performance with a transition from the CFA franc to a new currency, the eco, their Central African counterparts remain mired in problems.

Stability is a prized commodity, with violence involving jihadist militias wracking the Sahel – undermining hard-earned investment efforts by Burkina Faso and Mali, among others – and making Central African Republic all but ungovernable. Political transitions in Algeria and Sudan have yet to prove that established structures can be overthrown by popular movements, despite the creation of a civilian/military transitional government in Khartoum. Reforms since Abiy Ahmed became Ethiopia’s prime minister impressed sufficiently to win him the 2019 Nobel Peace Prize, but questions have emerged about the trajectory of change.

On the resources front, major minerals and hydrocarbons plays have until now been driven by demand from China, and other industrialised nations. Africa played an important role in



Beijing's rise to global power status, with China providing unprecedented levels of finance and infrastructure developments, in parallel with its appetite for natural resources. This means China now serves as the prism through which other nations define their relations with Africa.

Growing strategic competition has become apparent during Donald Trump's presidency, but involves more than just the US, China and former colonial powers. Newer players like Turkey, the UAE and Russia are making a mark on African conflicts and investment plays, while governments are increasingly realising they can use this competition to their advantage.

Carbon in transition

The 2014 oil price crash caused havoc in many resource producers. Covid-19 and conflict between key producers – wrecking the historic 2016 deal between Opec states, led by Saudi Arabia, and non-Opec countries, led by Russia – flooded the market in March 2020, just as oil-dependent economies like Republic of Congo were claiming some recovery. These developments could have long-term ramifications for oil prices and for the industry itself. Resources developers face longer-term problems in a world looking to tackle climate change by transiting out of carbon. While many producer governments are still in denial, their prized oil and coal reserves may never be developed. Many will be left with stranded assets, even if global oil consumption remains at around 100m b/d.

As the carbon transition accelerates, rising electric car sales in wealthier economies will lead more oil giants to become renewables-focused – a trend already under way at majors such as BP, Eni, Shell and Total. Gas producers seem in a better position, as they supply the transition fuel necessary to balance

electricity grids. However, even that could change as renewable technologies are increasingly supported by storage infrastructure, allowing surplus solar and wind to be used at night or during calm periods.

Next-generation natural resource plays will be a feature of this changing market, even before hydrogen and other fuels emerge to further challenge hydrocarbons. Increased dependence on lithium batteries, cobalt, helium and other raw materials for new technologies will accentuate the growing competition between global corporations, China and other players for rare minerals. These are present in countries like Democratic Republic of Congo that have been wracked by resource wars in previous decades. While global industries enter a period of accelerated change, African governments will have to move prudently to avoid the same old problems re-emerging.

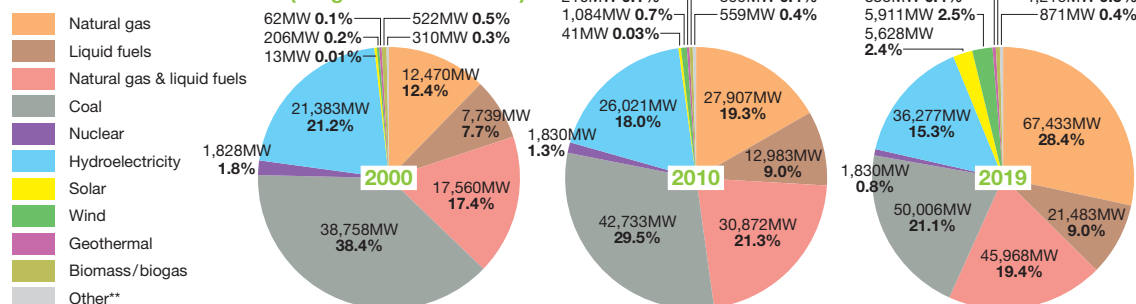
The Atlas team

The *African Energy Atlas* was created in 2007 to hold the growing store of cartographic materials built up by the *African Energy* newsletter, created in April 1998. It has since grown into a significant reference work covering *African Energy's* core areas of interest: power, upstream oil and gas, downstream hydrocarbons and wider African finance and policy issues. This content is complemented by *African Energy Live Data*, an industry-leading database with entries on more than 6,500 power generation projects and an ambitious growth trajectory.

Many of the maps in *Atlas 2020/2021* are informed by Live Data, which along with a wide variety of other sources have been crafted into maps by cartographer David Burles. *African Energy* editor Thalia Griffiths leads the publication with articles from Griffiths, *African Energy* power editor Dan Marks, associate editor John Hamilton and editorial director Jon Marks.

African Energy Live Data

ALL AFRICA ENERGY MIX (on-grid & distributed*)



* distributed includes off-grid and plants embedded within the grid but supplying third parties such as industries and mines.
** other includes combinations of fuels and hybrids where the individual capacities are not known, as well as ocean technologies, coal bed methane and industrial process heat.

Source: African Energy Live Data
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SCORECARD FOR 2019

	Installed capacity kept up with population?	Increase in installed capacity growth rate?	Installed capacity kept up with GDP growth?	Proportion of renewables increased?	Proportion of non-hydro renewables increased?	Increase in non-hydro renewables growth rate?	Proportion of liquid fuels* decreased?
AFRICA	YES (4.4% / 2.4%)	NO (4.4% / 9.0%)	NO (4.4% / 5.6%)	YES (21% / 20%)	YES (6% / 5%)	YES (23% / 20%)	NO (9.3% / 9.2%)
North Africa	YES (5.0% / 1.9%)	NO (5.0% / 16.7%)	NO (5.0% / 8.5%)	YES (10% / 8%)	YES (5% / 4%)	NO (45% / 48%)	NO (4.5% / 4.4%)
West Africa	YES (4.8% / 2.7%)	YES (4.8% / 2.3%)	NO (4.8% / 9.5%)	NO (20% / 20%)	YES (2.0% / 1.7%)	YES (25% / 18%)	NO (18% / 16%)
Central Africa	YES (4.3% / 2.8%)	YES (4.3% / 3.2%)	YES (4.3% / 4.0%)	NO (65% / 65%)	NO (0.2% / 0.2%)	NO (0% / 9.7%)	YES (14.2% / 14.8%)
East Africa	YES (3.3% / 2.4%)	NO (3.3% / 8.0%)	NO (3.3% / 7.6%)	YES (63% / 62%)	YES (15% / 12%)	YES (25% / 18%)	YES (27% / 29%)
Southern Africa	YES (3.6% / 2.4%)	YES (3.6% / 2.5%)	YES (3.6% / 2.5%)	NO (25% / 25%)	NO (6.5% / 6.5%)	NO (3.5% / 5.1%)	NO (8.5% / 8.5%)

*only plants running exclusively on liquid fuels are included in this figure

Sources: population and GDP from the International Monetary Fund (2020); African Energy Live Data
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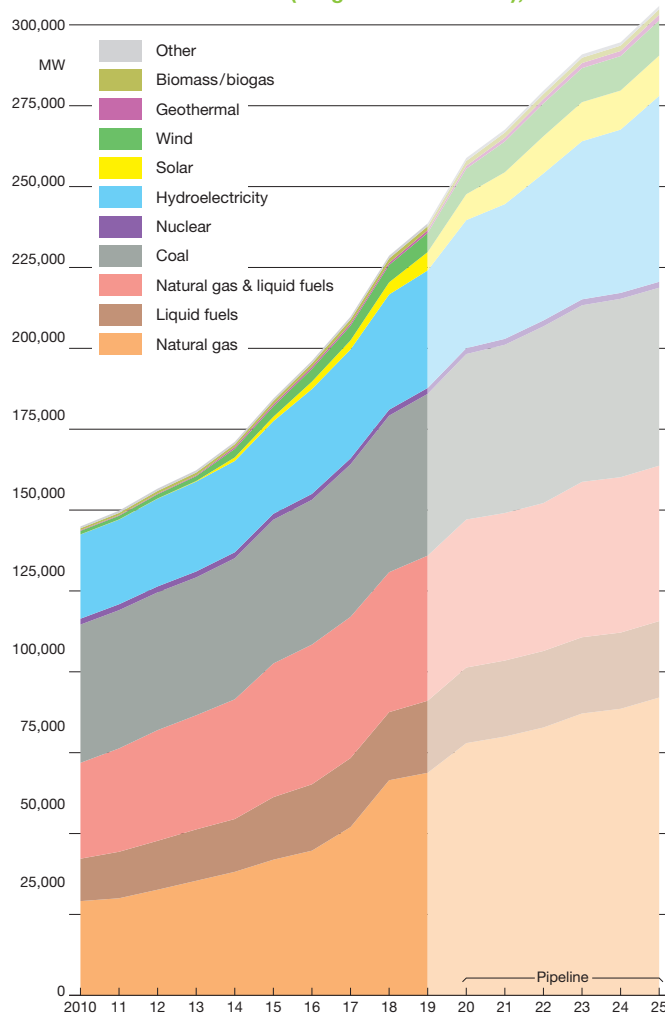
The Africa scorecard uses data from [African Energy Live Data](#) to provide snapshots of the state of the electricity sector during 2019. It illustrates whether electricity generation is expanding at the same rate as population and GDP growth, whether renewable energy use is increasing and if the rate of increase is being sustained, and whether reliance on costly fuel oils is being reduced.

All statistics were compiled before the impact of the coronavirus on the African power industry or economy could be assessed.

The graphics contained in these pages from [African Energy Live Data](#) illustrate the many transitions that Africa is going through and that these are still only at an early stage.

- The scorecard shows that the growth rate of non-hydropower renewable power continues to be exponential, with a year-on-year increase of 23% in 2019 compared to 20% in 2018.
- Overall growth of installed capacity has slowed however, as can be seen from the scorecard, and the proportion of costly and polluting liquid fuels in the energy mix marginally increased.
- This hints at underlying transitions in market structure which have slowed the pace of growth. Attention has shifted to transmission and distribution, while many governments are looking to the private sector for investment and scaling back the role of state-owned enterprises.
- The graph on page 9 showing net capacity additions by ownership type shows that by 2022, more than half of new capacity additions in each region will be privately funded. Given the short lead times of private wind and solar plants this is likely to be an underestimate.
- Regionally, North Africa will continue to be the largest market but other regions are set to gain in importance. West and Southern Africa have growing pipelines of projects which are here significantly underestimated because likely large

ALL AFRICA ENERGY MIX (on-grid & distributed), 2010–25



INSTALLED ON-GRID GENERATION CAPACITY BY COUNTRY AND FUEL, Q1 2020

MW	 Natural gas	 Liquid fuels	 Natural gas & liquid fuels	 Coal	 Nuclear	 Hydro-electricity	 Solar	 Wind	 Geothermal	 Biomass/biogas	 Other	TOTAL
Algeria	20,062	–	465	–	15	216	366	10	–	–	–	21,134
Angola	500	1,732	95	–	–	3,387	–	–	–	–	–	5,715
Benin	20	59	147	–	–	–	–	–	–	–	–	226
Botswana	–	105	90	600	–	–	–	–	–	–	–	795
Burkina Faso	–	330	–	–	–	37	35	–	–	–	–	402
Burundi	–	41	–	–	–	32	–	–	–	–	–	73
Cameroon	267	384	–	–	–	827	–	–	–	–	–	1,478
Cape Verde	–	197	–	–	–	–	9	29	–	–	–	234
Central African Republic	–	6	–	–	–	19	–	–	–	–	–	25
Chad	–	120	–	–	–	–	–	1	–	–	–	121
Comoros	–	41	–	–	–	–	–	–	–	–	–	41
Congo, Dem. Rep.	–	13	–	–	–	2,357	1	–	–	–	5	2,376
Congo, Rep. (Brazzaville)	534	55	–	–	–	194	–	–	–	–	–	783
Côte d'Ivoire	657	–	643	–	–	879	–	–	–	–	–	2,179
Djibouti	–	143	–	–	–	–	–	–	–	–	–	143
Egypt	21,179	1,290	31,542	–	–	2,832	1,514	1,388	–	–	140	59,885
Equatorial Guinea	154	29	24	–	–	127	5	–	–	–	–	339
Eritrea	–	153	–	–	–	–	–	7	–	–	–	160
eSwatini (Swaziland)	–	–	–	–	–	60	–	–	–	40	–	100
Ethiopia	–	96	–	–	–	3,817	–	324	9	25	–	4,270
Gabon	336	19	30	–	–	324	–	–	–	–	–	709
Gambia	–	128	–	–	–	–	–	–	–	–	–	128
Ghana	1,026	750	1,659	–	–	1,580	43	–	–	2	–	5,059
Guinea	–	281	–	–	–	366	–	–	–	–	–	647
Guinea-Bissau	18	33	–	–	–	–	–	–	–	–	–	50
Kenya	–	742	–	–	–	828	56	336	823	3	–	2,788
Lesotho	–	3	–	–	–	73	–	–	–	–	–	76
Liberia	–	60	–	–	–	88	–	–	–	–	–	148
Libya	3,606	1,675	5,609	–	–	–	–	–	–	–	–	10,890
Madagascar	–	577	–	–	–	137	20	–	–	–	–	734
Malawi	–	141	–	–	–	318	–	–	–	–	–	459
Mali	–	349	–	–	–	318	–	–	–	–	–	667
Mauritania	–	122	180	–	–	–	36	30	–	–	–	368
Mauritius	–	432	–	61	–	61	86	13	–	22	37	711
Morocco	1,479	1,182	–	3,767	–	1,757	585	806	–	–	–	9,575
Mozambique	458	204	–	–	–	2,183	30	–	–	–	–	2,875
Namibia	–	23	–	120	–	347	127	5	–	–	–	622
Niger	–	163	–	–	–	–	7	–	–	–	–	170
Nigeria	10,006	–	1,329	–	–	1,938	–	5	–	–	–	13,278
Rwanda	–	84	–	–	–	93	9	–	–	–	–	186
São Tomé & Príncipe	–	35	–	–	–	3	–	–	–	–	–	37
Senegal	24	1,040	–	–	–	–	110	52	–	–	–	1,225
Seychelles	–	103	–	–	–	–	–	6	–	–	–	109
Sierra Leone	–	106	–	–	–	52	–	–	–	–	–	158
Somalia	–	7	–	–	–	–	–	–	–	–	–	7
South Africa	19	3,548	–	43,052	1,800	3,600	2,153	2,118	–	38	–	56,329
South Sudan	–	12	–	–	–	–	–	–	–	–	–	12
Sudan	–	1,541	487	–	–	1,913	–	–	–	–	–	3,941
Tanzania	729	100	120	–	–	563	–	–	–	–	–	1,512
Togo	–	48	120	–	–	33	–	–	–	–	–	201
Tunisia	4,598	–	1,043	–	–	55	10	246	–	1	27	5,980
Uganda	–	120	–	–	–	992	54	–	–	–	11	1,177
Western Sahara*	–	263	–	–	–	–	80	207	–	–	–	549
Zambia	–	105	–	300	–	2,397	77	–	–	–	–	2,878
Zimbabwe	–	–	–	1,210	–	1,081	3	–	–	–	–	2,294
North Africa	50,924	4,409	38,659	3,767	15	4,859	2,556	2,656	0	1	167	108,013
Sub-Saharan Africa	14,747	14,377	4,924	45,343	1,800	31,026	2,860	2,925	831	129	53	119,015
TOTAL	65,671	18,786	43,583	49,110	1,815	35,886	5,415	5,581	831	130	220	227,028

*under UN mandate – indicates less than 1MW or zero Source: African Energy Live Data

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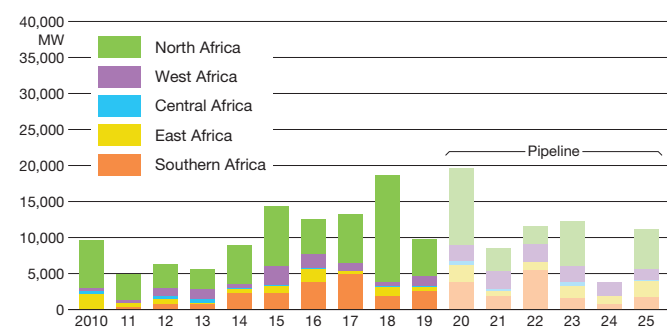
procurement programmes in South Africa are not counted by Live Data until procurement is under way.

• It is clear from page 10 that 2019 was a breakthrough year for solar power. Nearly 2GW was added while in previous years capacity additions have never exceeded 1GW. The market is also increasingly diverse, with large numbers of small projects and increasing numbers of small and medium projects.

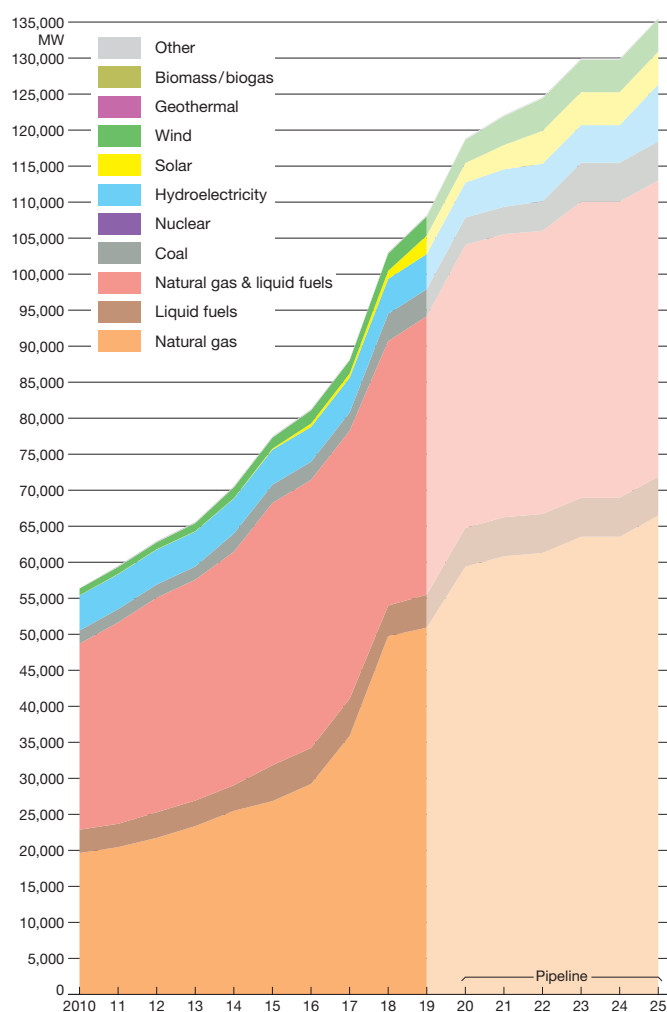
• Wind continues to make slower progress. The number of large projects continues to increase but there are fewer medium and smaller projects. This represents a problem for the wind industry, as it is more reliant on a few large markets and it has struggled to add new revenue streams in the way that solar has. In particular, it has so far been unable to take advantage of the burgeoning commercial and industrial market.

African Energy Live Data

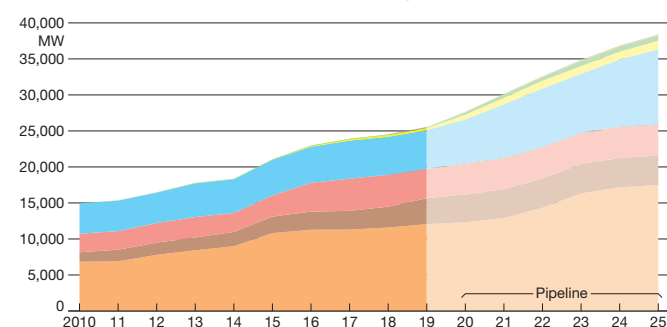
NET ANNUAL CAPACITY ADDITIONS BY REGION, 2010-25



NORTH AFRICA ON-GRID ENERGY MIX, 2010-25



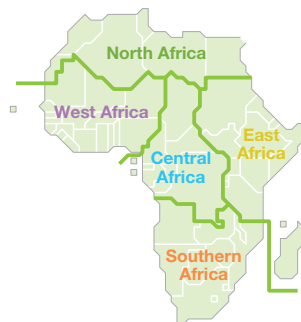
WEST AFRICA ON-GRID ENERGY MIX, 2010-25



Source for all charts: African Energy Live Data

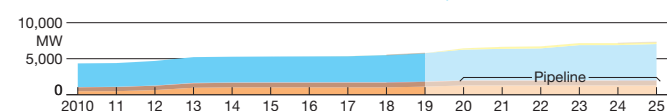
• North Africa remains by some way the largest market in Africa. This is illustrated by the to-scale graphics on this page. The region has seen a burst of activity in Egypt, adding large volumes of gas, solar and wind power to the grid. Morocco and Tunisia are also becoming major markets for solar power development, with wind programmes also significant.

• Central Africa continues to lag and the current pipeline suggests it will fall even further behind. Political instability, poor governance and weak economies prevent large-scale investment as well as deterring off-grid providers.

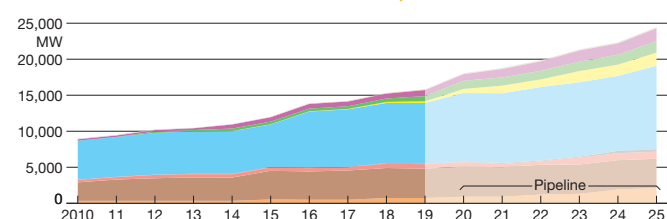


• New interconnections combined with pragmatic leadership and growing economies could see East Africa emerge as a significant market. The

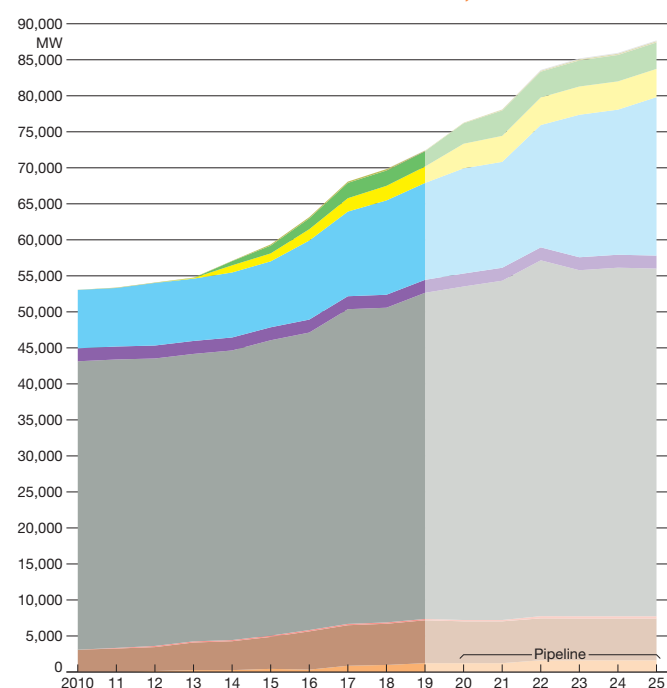
CENTRAL AFRICA ON-GRID ENERGY MIX, 2010-25



EAST AFRICA ON-GRID ENERGY MIX, 2010-25



SOUTHERN AFRICA ON-GRID ENERGY MIX, 2010-25



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region is already emerging as a driver of innovative policy, and regulation and investment into renewable energy is increasing rapidly. It is a hub and incubator for the off-grid industry as well as having established a track record of utility and market reform.

- Southern Africa is also set to see substantial investment in renewable energy. Solar, wind and hydropower in particular are likely to increase substantially while coal capacity is set to decrease as existing plants in South Africa are decommissioned.
- West Africa has been hampered by poor policy making resulting in inefficient grids unable to support major industrial demand. The region is a major target for commercial and industrial developers supporting industry and mines using diesel to manage sporadic grid supply. The region is in danger of missing out on low cost renewable energy which could offset the cost of expensive thermal power. Greater regional interconnectivity may help in this regard, particularly by introducing policy and regulatory competition.
- The graphic below illustrates the slow and patchy growth of private sector investment on the continent over the decade. State-owned investment has been much more significant and also grew more rapidly until 2019.
- There are significant time lags in power sector development given the average development time on the continent, which is believed to be around seven years. A long period of reform is

Identify power plants and analyse markets

African Energy Live Data is a live-updated online database featuring more than 6,500 power plants and projects across Africa.

- Identify owners, developers, offtakers, financiers and their portfolio of projects and find opportunities for investment and sales
- Support strategic planning by analysing trends by country from 2010 alongside key economic & demographic statistics

Contact Alex Wark for a demonstration.

E: sales@africa-energy.com

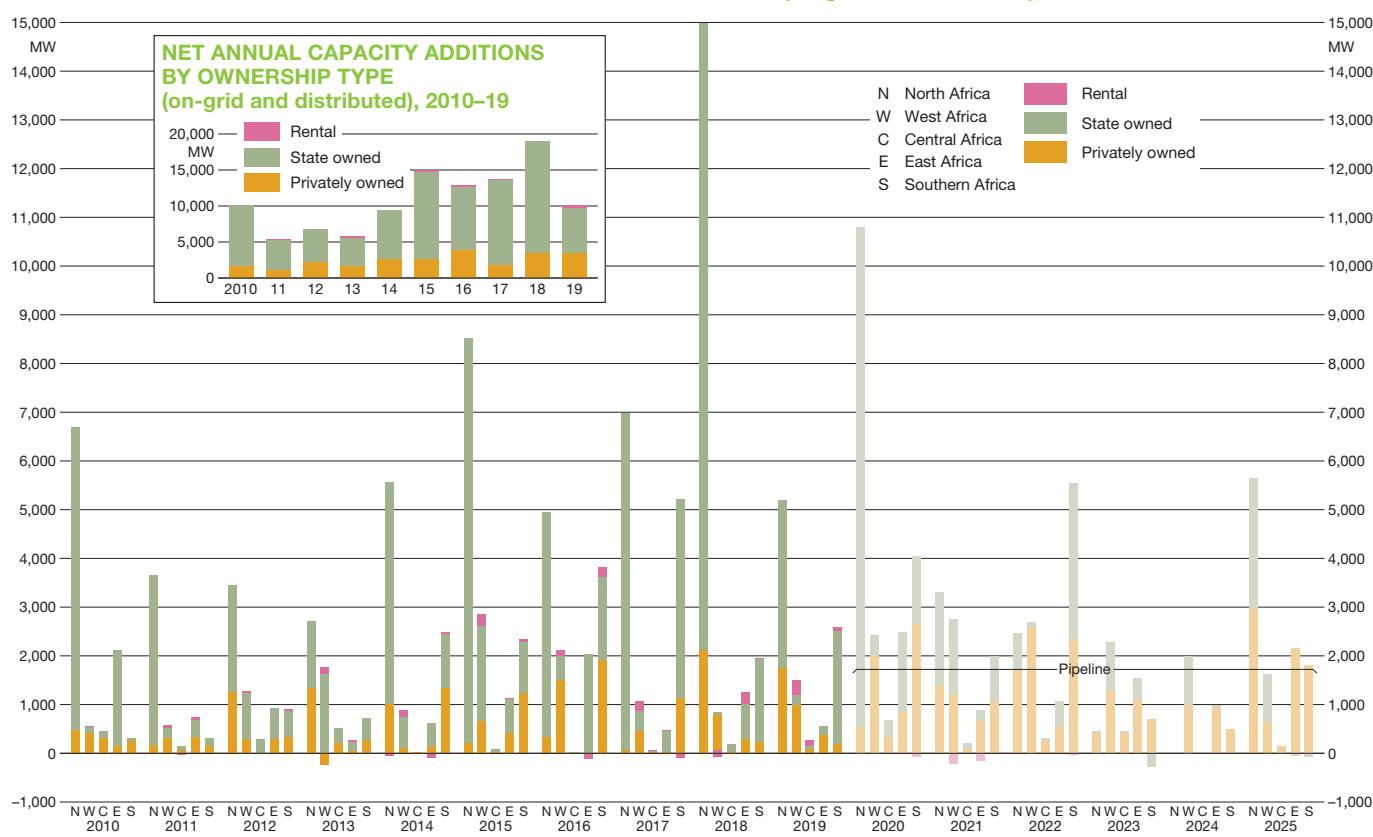
www.africa-energy.com/database



starting to pay off, with 2019 showing more private than public investment in generation in both East and West Africa.

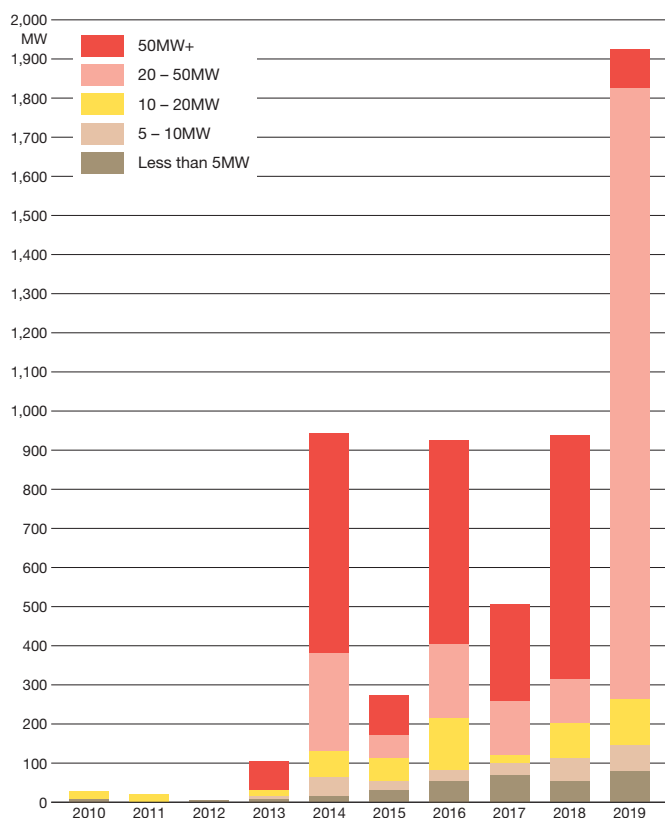
- The pipeline shows that the private sector will become the leading source of investment into generation from 2022. This creates new challenges, such as the need to move away from government guarantees through market and utility reform. Focus in the past has been on creating independent power producer and public-private partnership frameworks and credible procurement programmes. Moving forwards, governments will be pushed to create financially viable and efficient markets capable of generating and growing the revenues needed to support private investment.

NET ANNUAL CAPACITY ADDITIONS BY OWNERSHIP TYPE AND REGION (on-grid and distributed), 2010-25

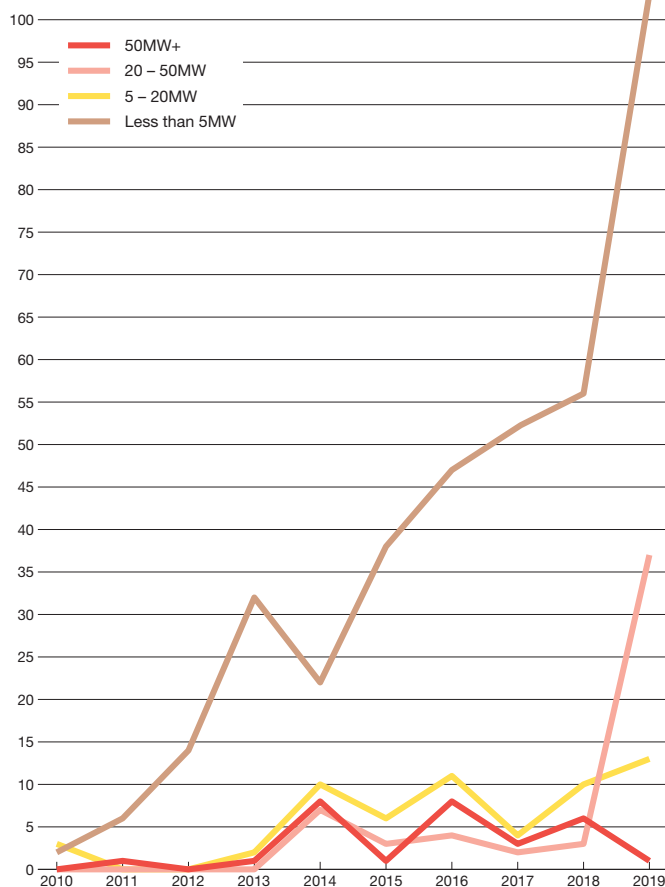


African Energy Live Data

SOLAR CAPACITY ADDITIONS BY PROJECT SIZE, 2010-19



NUMBER OF SOLAR PROJECTS ADDED BY SIZE, 2010-19



Source for all charts: African Energy Live Data

- Solar and wind continue to make inroads into African markets as they become the cheapest source of energy and a useful complement to grids overly reliant on seasonal hydropower or costly thermal power.

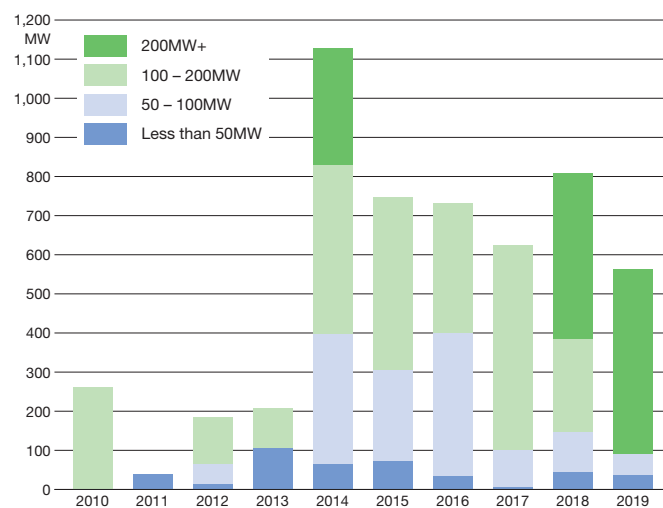
- 2019 saw a step change in solar investment, where the capacity added more than doubled to nearly 2GW in one year, around 20% of all new capacity. Prior to the coronavirus, similar capacity additions were expected in the years 2020-2022.

- Medium-large capacity solar projects remain the most valuable market, boosted in 2019 by the commissioning of many 50MW projects at Benban in Egypt. The 50MW+ market was the most valuable 2013-2018, led by procurement in South Africa.

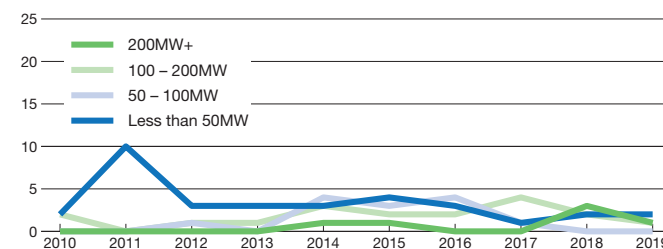
- Small and micro solar projects less than 20MW is a growing market representing more than 250MW in 2019. This is an underestimate due to the lack of data on projects smaller than 1MW. 10-20MW is an emerging market with significant potential in Africa due to the possibility of locating these projects close to demand centres without major grid upgrades and lower impact on government balance sheets. Projects in the 5-10MW range have been constrained by high development costs relative to returns.

- There has been very strong growth in the 0-5MW solar market, which is dominated by commercial and industrial (C&I) plants. Several private equity funds have made C&I their first investment as it offers a potentially quicker and better diversified route to project portfolios with total installed capacity comparable to a utility-scale plant.

WIND CAPACITY ADDITIONS BY PROJECT SIZE, 2010-19

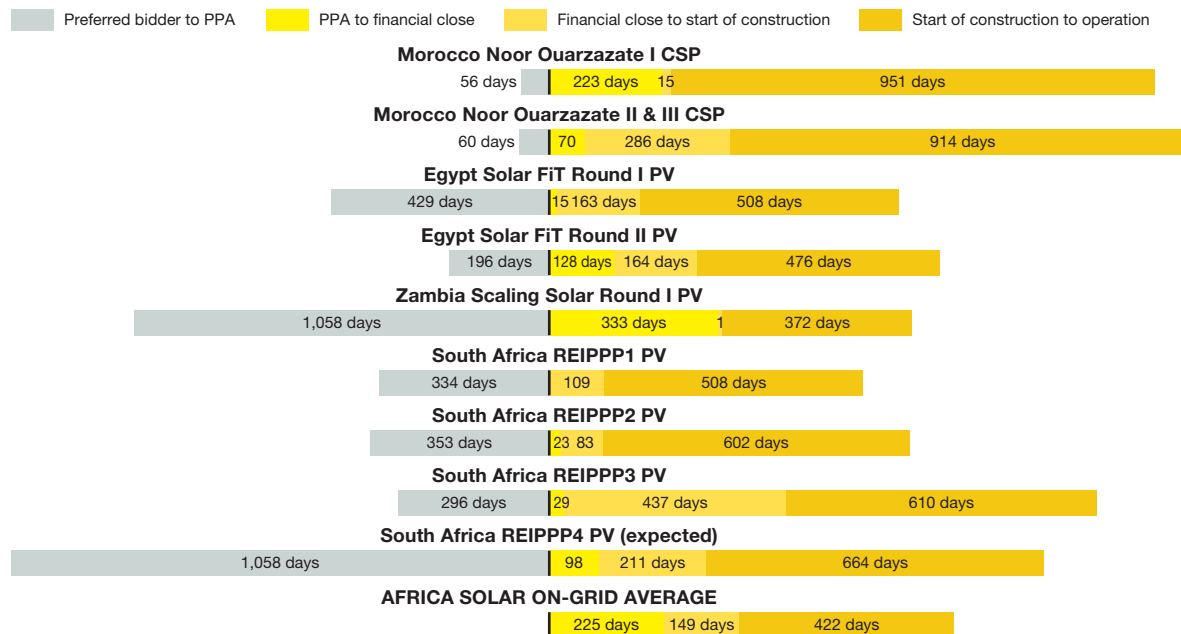


NUMBER OF WIND PROJECTS ADDED BY SIZE, 2010-19

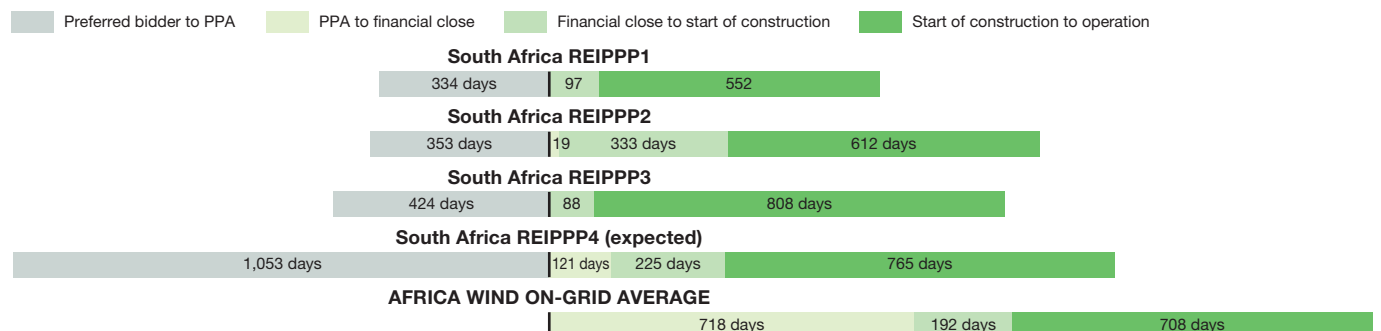


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AVERAGE SOLAR DEVELOPMENT TIMELINES BY PROCUREMENT PROGRAMME



AVERAGE WIND DEVELOPMENT TIMELINES BY PROCUREMENT PROGRAMME



Source for both charts: African Energy Live Data

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• The wind power market has become more concentrated, failing to achieve consistent growth. While large-scale projects offering very low tariffs have become more prevalent in more developed markets, investment into smaller and medium sized projects has diminished.

• The result is an over-reliance on a few large markets. Countries with smaller grids have been unable to access the potentially very low cost technology. This is often due to poor wind resources but in many countries because of difficult logistics and a lack of institutional capacity and policy.

• The graphic above compares the timelines of several high profile procurement programmes. One of the aims of the procurement programmes was to speed up delivery of projects, as well as reduce the cost of power.

• Although prices fell over rounds in nearly all cases – partly as a result of the falling cost of technology and partly greater experience and more developed supply chains in-country – timelines have more often lengthened.

• In South Africa, despite procurement of new capacity becoming more urgent, the time from selection as a preferred

bidder to operation has increased in every round, from 951 days in round 1 for solar to 2,031 days in round 4. For wind it increased from 983 days to 2,164 days. This time does not include the preparation of projects for bidding, an intensive process in South Africa.

• In South Africa, solar projects selected in rounds 3 and 4 took longer to move from the signing of key agreements to commercial operations than the African average. This is true of most of the Egyptian solar feed-in tariff projects.

• The growing inefficiency of the South African process is illustrated by the fact that the large and more complex concentrated solar projects procured in Morocco were delivered within a comparable timeframe, despite construction delays.

• For wind, however, it is clear that procurement programmes have substantially reduced development time from signing key agreements to commercial operation. In fact, in all but round 4 in South Africa the entire process from selection as a preferred bidder to operation was quicker than the average time from agreement signing to commercial operation on the continent.

African connections: Roads, railways, ports, airports

SINGLE AFRICAN AIR TRANSPORT MARKET

SAATM is a flagship project of the AU's Agenda 2063 and aims to create a single unified air transport market in Africa, liberalise civil aviation and act as an impetus to the continent's economic integration agenda. Officially launched in January 2018 with 23 countries as starting participants.

MOROCCO

HIGH-SPEED RAIL

Africa's first high-speed rail service, Al-Boraq, linking Casablanca with Tangier opened in 2019.

TRANS-SAHARAN TRADE ROUTES

Ancient trade routes that crossed the Sahara Desert have been adapted for formal and informal trade, including a variety of smuggling networks.

ALGERIA'S EAST-WEST HIGHWAY (A1)

A six-lane 1,200km road running from the Moroccan border to the Tunisian border built by Chinese (west and central sections) and Japanese (east) consortia.

EGYPT'S NEW CAPITAL CITY

A 700 km² development 45km east of Cairo with an international airport is planned to accommodate 5m and become Egypt's new administrative capital; developed by the government and the military.

NEW EGYPTIAN AIRPORTS

The construction of five new airports was announced in 2017: Sphinx International Airport in Giza, New Capital Airport, Bredwell Airport in Sinai, South Red Sea Airport and Ras Sidr Airport. Japan is funding a new passenger terminal at Alexandria's Borg El Arab International Airport.

KHARTOUM NEW INTERNATIONAL AIRPORT

KNIA began construction in 2019; it will have a capacity of approximately 7.5m passengers/yr.

ADDIS ABABA AIRPORT

Bole International Airport has been expanded to triple its capacity. A new terminal opened in January 2019 can accommodate up to 22m passengers/yr.

ETHIOPIAN RAILWAYS

A standard gauge railway running north from Awash to Weldiya and Mekele is being built.

ETHIOPIA-DJIBOUTI RAILWAY

Africa's second electric railway began operations in 2016, linking Addis Ababa with Djibouti's new Doraleh Multipurpose Port.

DJIBOUTI

Chinese-funded projects include three ports, two airports and a water pipeline from Ethiopia, as well as a Chinese military base.

KENYAN RAIL

STANDARD GAUGE

Standard gauge railway from Mombasa via Nairobi and Embakasi inland container depot, with proposed extensions to Kisumu and the Ugandan border.

GAUGE

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DAKAR'S NEW AIRPORT

Blaise Diagne International Airport opened in December 2017. Costing \$575m, it has a capacity of 10m passengers/yr.

TRANSGUINEAN RAILWAYS

Proposed rail links taking minerals to a planned deep-water port SE of Conakry.

BENIN BACKBONE PROJECT

Includes a new Semé-Kraké airport to serve southern Nigeria and Benin, rehabilitation of the Cotonou-Parakou railway and construction of an international standard gauge railway linking Parakou with Niamey.

NIGERIA RAIL

Abuja-Kaduna railway opened in 2016, part of a CCECC contract to equip the Lagos-Kano route with modern standard gauge rail. The same company is building the Lagos-Calabar highway. Future Port Harcourt-Maiduguri and Lagos-Calabar rail lines are being supported by Russia.

LEKKI DEEP SEA PORT

Construction has begun on developing new container and berth facilities in Lagos Free Trade Zone by Singapore-based Tolaram Group's Lekki Port LFTZ Enterprise.

KRIBI PORT & INDUSTRIAL COMPLEX

China Harbour Engineering Company are building a new deep-sea port and associated infrastructure on the southern Cameroonian coast, opening the region's minerals, cotton and other commodities to the world's markets. A railway linking Kribi to southern Cameroon's Mbalam iron ore deposit is also being developed.

BENGUELA RAILWAY

Linking the port of Lobito with the DRC, it provided an export route for Zambian and Congolese copper during the mid-20th century. Heavily damaged during the Angolan civil war (1975-2002), a new line has been built with Chinese help. The Lobito-Luau section opened in 2015 and a full service from Tenke began in 2018.

WALVIS BAY CORRIDORS

A network of transport corridors linking Namibia's largest port with:

1. SOUTH AFRICA:

TRANS-ORANJE, to Pretoria/Johannesburg via Upington,

with a link to Lüderitz;

TRANS-KALAHARI, to Pretoria/Johannesburg via Botswana. A railway to export Botswana coal is proposed, to run alongside the highway.

2. ZAMBIA: TRANS-CAPRIVI, a strong competitor to the Tazara railway for Zambian and DRC copper exports.

3. ANGOLA: TRANS-CUNENE.

NORTH-SOUTH CORRIDOR

A Comesa initiative comprising a road and rail network of over 10,000km, linking eight countries in Southern and Central Africa () with the aim of strengthening cross-border trade and tourism.

TRANS-AFRICAN HIGHWAYS (TAH)

An international programme to develop a transcontinental road network.

NORTH-SOUTH ROUTES:

TAH-2: Algiers-Agadez-Lagos (Trans-Sahara)

TAH-3: Tripoli-N'Djamena-Kinshasa-Windhoek-Cape Town

TAH-4: Cairo-Khartoum-Addis Ababa-Nairobi-Lusaka-Gaborone-Cape Town

EAST-WEST ROUTES:

TAH-1: Cairo-Tripoli-Algiers-Rabat-Dakar

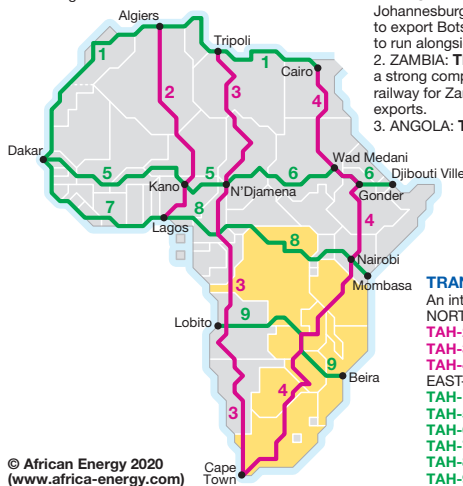
TAH-5: Dakar-Bamako-N'Djamena

TAH-6: N'Djamena-Djibouti

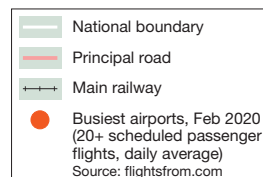
TAH-7: Dakar-Freetown-Abidjan-Lagos

TAH-8: Lagos-Yaoundé-Bangui-Kisangani-Nairobi-Mombasa

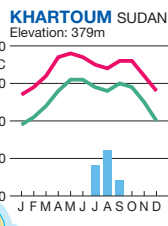
TAH-9: Lobito-Lubumbashi-Harare-Beira



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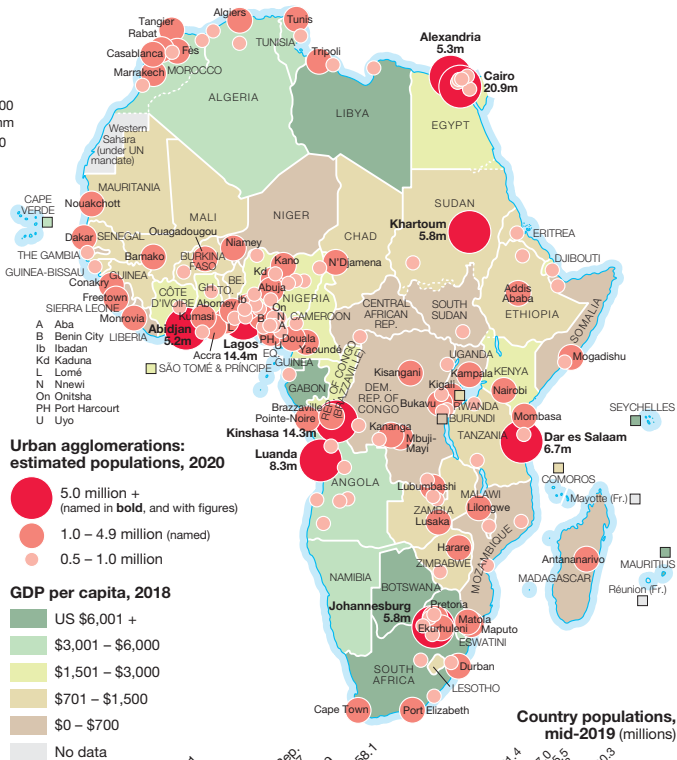
— Ave. daily max. temp.
— Ave. daily min. temp.
■ Ave. precipitation



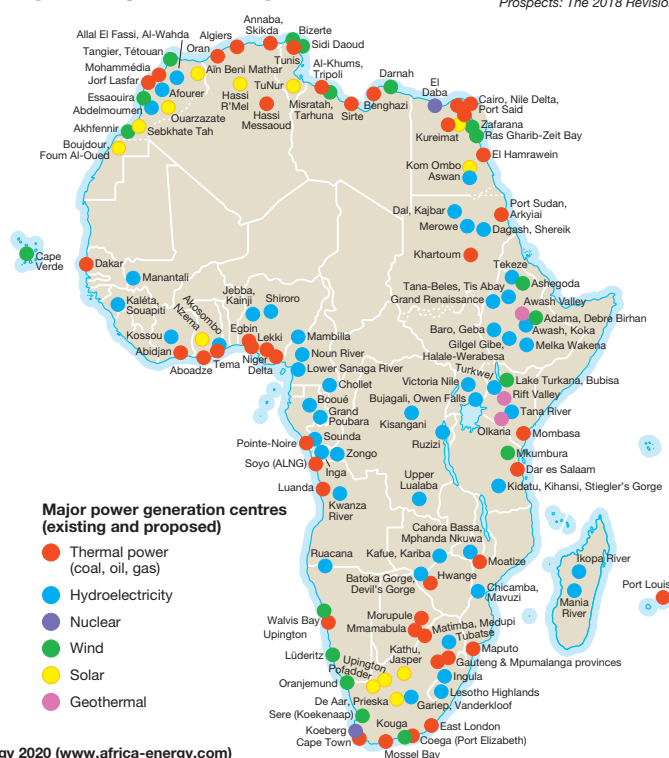
Production



**Urban agglomerations:
estimated populations, 2020**



**Major power generation centres
(existing and proposed)**



Financiers see huge potential but bottlenecks frustrate as debt rises again

Huge figures are bandied about for infrastructure costs and for the funds to support the carbon transition. But while financiers have money for well-structured projects, a potential revolution in energy investment is held back by lack of capacity, moribund markets and governance shortfalls, while heavily indebted resource-dependent economies remain as vulnerable as ever to volatile global markets. Covid-19 will accentuate these weaknesses

Advisers and financiers hungry for above-average rates of return and new business opportunities have talked up Africa's potential to emerge as a major frontier for private infrastructure financing. Their support for a far greater number of IPPs and other privately financed infrastructure, longer-term debt financing operations, mergers and acquisitions and other transactions holds undoubted promise for cash-strapped but potentially fast-growing economies. In parallel, China has taken a lead in developing sometimes controversial financing structures that have seen huge investments in infrastructure becoming a reality as roads are built and electricity generated.

Others see the potential for providing billions of dollars more, as the World Bank Group, African Development Bank (AfDB), European Union, Germany, France and other bilateral donors have all placed infrastructure at the centre of their development policies. AfDB vice-president for private sector, infrastructure and industrialisation Pierre Guislain has estimated Africa's infrastructure needs at \$130bn-\$170bn/yr, with a financing gap of \$68bn-\$108bn. He argued that, while "this may sound insurmountable, it also presents an opportunity to foster innovative financial solutions and partnerships that have the potential to unlock funding".

This huge challenge will be amplified by the Covid-19 pandemic, which was blighting economies worldwide as *Atlas 2020/2021* was published. The early signs were not promising, with investors likely to seek comfort in established markets rather than emerging frontiers for investment.

The global health crisis came after a period when private equity and other cutting-edge investors had worked hard to unlock Africa's infrastructure potential, seeking to tap new interest from pension funds, sovereign wealth funds, equities market and other private investors, which have so far been largely absent from deals on the continent. Long underdeveloped sectors such as power generation in sub-Saharan Africa have seen an uptick in private support, but have a majority of economies seen a big financial boom in line with the continent's ambitions? The brutal answer was 'no', even before the Covid-19 pandemic undermined so many assumptions. Local and international private financing flows for critical sectors like water and sanitation, electricity distribution and transmission remain elusive in all but a few economies.

The problems are familiar: persistent bottlenecks due to bureaucracy, over-complex and costly financial structures and

insolvent local counterparts continue to hold up otherwise commercially viable schemes. IPPs, merchant power structures and investment in transmission companies are the norm in Latin America and Asia, but in Africa, the number of IPPs – while growing – remains highly constrained, and successful private electricity distribution companies like Umeme in Uganda are very much an exception.

Africa is looking at African solutions to raise finance via local banks, pension funds and other emerging investor classes. Initiatives such as the African Continental Free Trade Area have potential to create a vibrant new trading bloc in regions that transact a pitifully small percentage of their commerce with their neighbours. It is not surprising that West Africa, which has done more than most to promote open borders – and, via the CFA franc, a common currency – is the most integrated. Where borders remain closed – as between Algeria and Morocco since 1994 – all sides lose.

Local content

African resources have global importance, but investors still find it hard to place their money in these industries, despite countries promoting local content initiatives that give a minimum percentage of equity in oil fields to local companies. Nigeria has developed a well-established network of indigenous companies operating across its oil industry. New upstream licences in Republic of Congo require 25% local content, usually around 10% for state-owned Societe Nationale des Petroles du Congo and the rest for local private companies; they may lack the capital necessary to finance their share and could carry reputational risks from beneficial ownerships involving politically exposed persons.

South Africa needs huge uplift for a population that, nearly 30 years on, is still waiting for its post-apartheid expectations of social equity and economic advancement to be met. The black economic empowerment industry has become associated with crony capitalist ploys to enrich only a few. During Jacob Zuma's failed presidency, the once mighty state utility Eskom was potentially fatally damaged by economic mismanagement and state capture. Eventually even the Renewable Energy IPP Procurement Programme – widely seen as a model for solar and wind procurement on the continent – was endangered.

Efforts to strengthen both national public sector structures and local business practices are essential if Africa is to attract anywhere near the necessary levels of financing to support

sustainable growth. Among initiatives, the African Legal Support Facility in Abidjan is working to strengthen public sector entities such as the many all but insolvent public utilities, which make very weak counterparts for private sector investors, and governments that in negotiations are often confronted by batteries of expensive international lawyers.

The Chinese model of infrastructure financing has produced some remarkable results, even if critics point to problems associated with the unexpectedly high cost of financing linked to asset-backed deals, the employment of Chinese personnel over local workers, and major operations and maintenance shortfalls. Its '85-15' model involves China putting up 85% of a project's cost in supposedly soft loans backed by Chinese insurers. Often linked to exports of oil or minerals to feed huge Chinese demand, these structures have allowed cash-strapped economies like Guinea to build infrastructure that might otherwise prove impossible.

Debt distress

This model, too, is showing strains as the Chinese state and corporates look to place projects on a more commercial basis. As payments arrears have built up across sub-Saharan Africa,

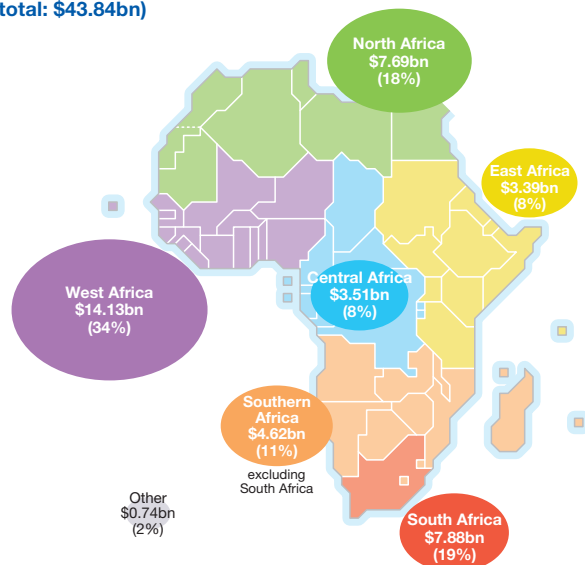
Republic of Congo's mid-2019 debt restructuring set a precedent by involving the Chinese government in rescheduling an unsustainable debt. Nearly a quarter of Kenya's total external debt is now owed to China – much of it linked to the controversial standard gauge railway scheme – on terms that have proved more onerous than expected at the time loans were publicly signed. What is certain is that interest rates are higher and maturities shorter on Chinese debt than the terms offered by the World Bank and AfDB.

The International Monetary Fund has expressed increasing concern that levels of debt distress are again rising across the continent. Chinese loans are most often cited as a cause, but African treasuries have built up a range of debt from sovereign bonds to domestic paper. Earlier in the decade, a return to borrowing via bond markets was seen as a signal of renewed strength; some borrowers, including Ghana and Gabon, are even now still talking about new Eurobonds. But the mood of debt markets is generally depressed, despite the temptations of globally low interest rates.

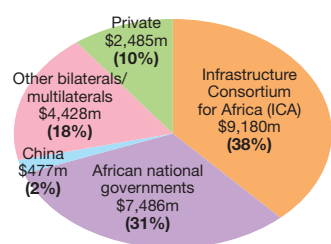
Another oil price crash has the potential to cause havoc in resources producers. The 2016 deal between Opec and non-Opec countries helped to stabilise prices and improve producers' finances. However, this unravelled dramatically as Saudi Arabia and Russia fell out in March 2020 over how to accommodate US shale production and their own ambitions to dominate the market. In a bid to arrest a dramatic price collapse and stabilise global markets, producers were obliged to agree the biggest oil production cuts in history.

While apparently good news for oil importers, lower prices also have ramifications for other natural resources producers, given uncertain global growth and declining commodity demand. Like junior and independent oil companies, publicly listed mining companies face a difficult outlook. Many of these players anyway face longer-term problems in a world looking to tackle climate change by transiting out of carbon. While many producer governments are still in denial, their prized oil and coal reserves may never be developed (and certainly not on the terms some still demand). Many will be left with stranded assets.

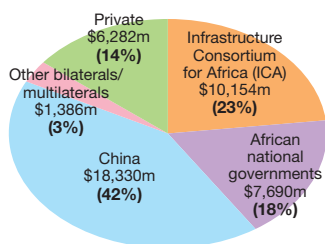
TOTAL ENERGY SECTOR FINANCING BY REGION, 2018
(total: \$43.84bn)



ENERGY SECTOR FINANCING BY SOURCE, 2014



ENERGY SECTOR FINANCING BY SOURCE, 2018



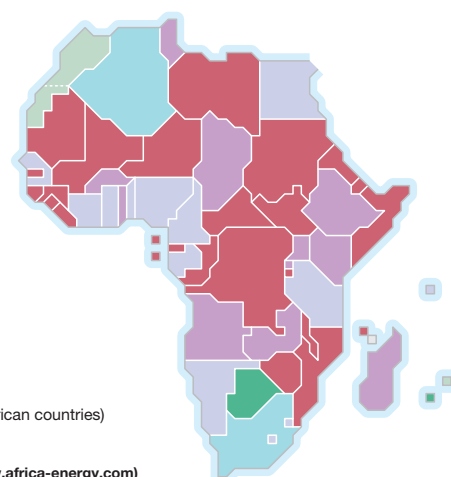
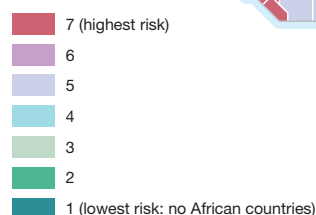
ICA members: African Development Bank (AfDB), Development Bank of Southern Africa (DBSA), European Commission (EC), European Investment Bank (EIB), World Bank Group, G7 countries (Canada, France, Germany, Italy, Japan, UK, USA), Russian Federation, South Africa.

Source: ICA, Annual Report 2018

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POLITICAL RISK RATINGS, MARCH 2020

Medium/long-term political risk ratings for African countries' export transactions under the OECD consensus

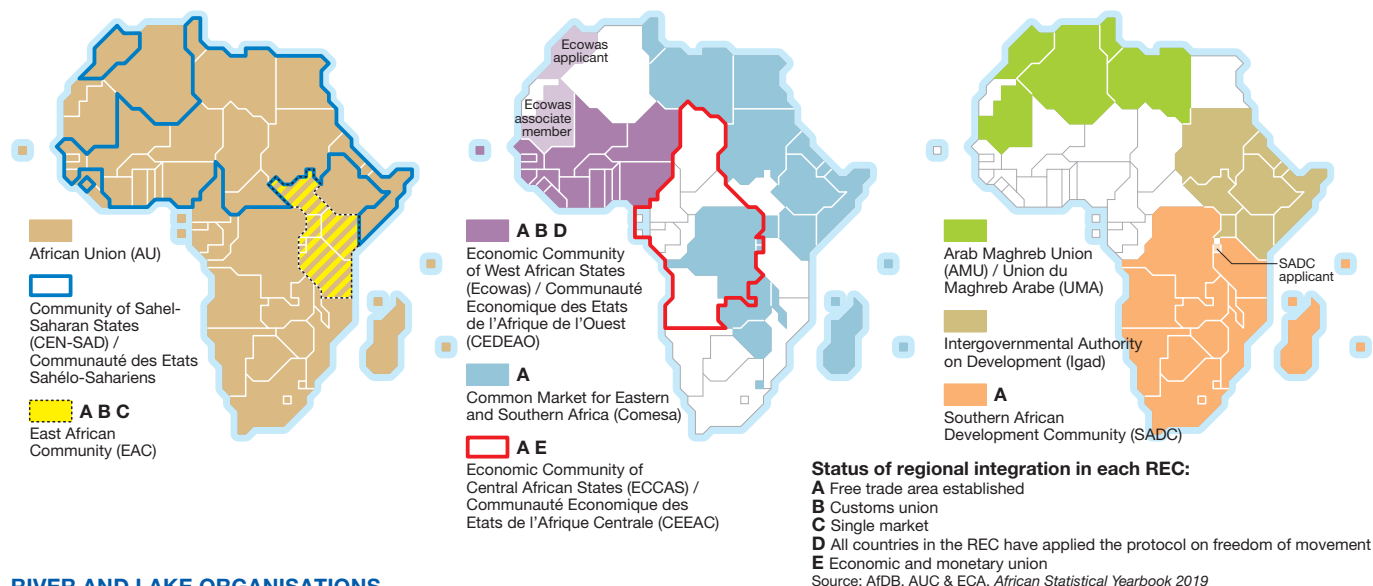


Source: www.credendo.com

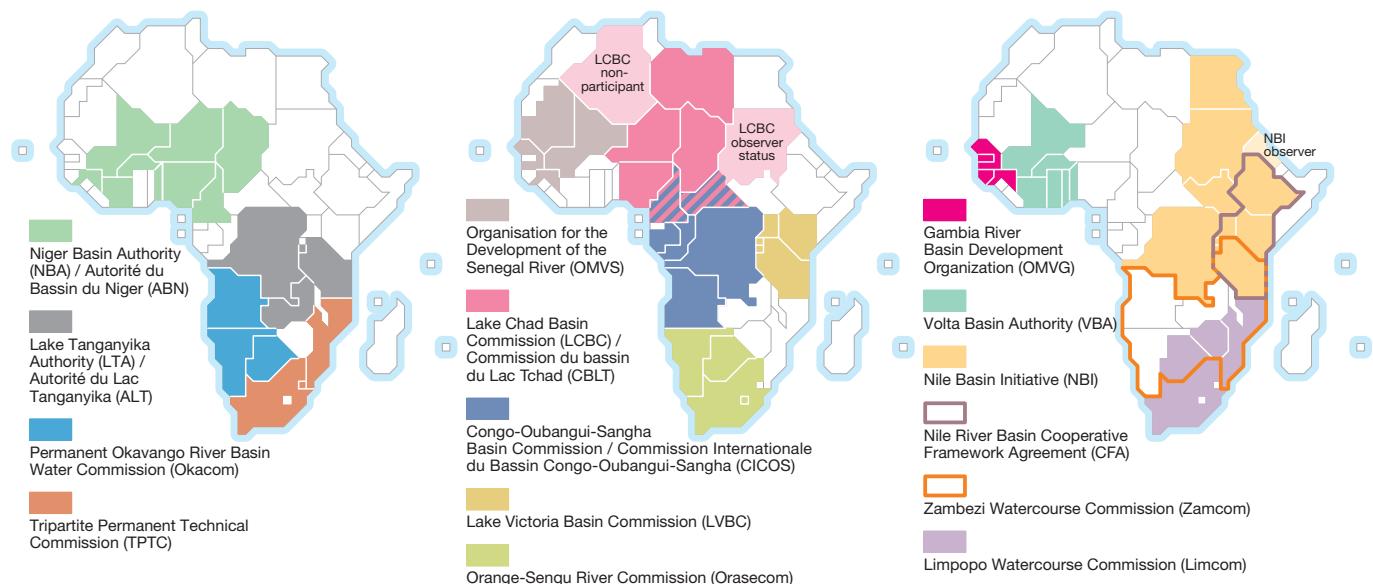
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Regional groupings

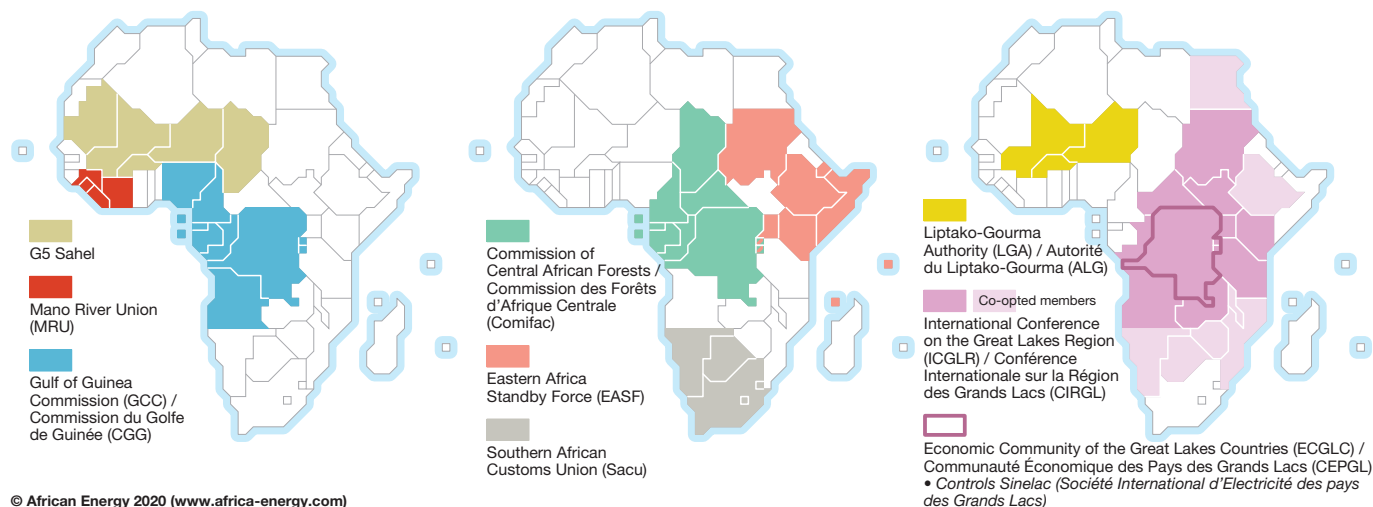
THE AFRICAN UNION AND REGIONAL ECONOMIC COMMUNITIES (RECs) RECOGNISED BY THE AU



RIVER AND LAKE ORGANISATIONS



OTHER ECONOMIC, SECURITY AND ENVIRONMENTAL ORGANISATIONS



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For Africa's monetary groupings, see page 17; for regional power pools, see page 21

NAME Members of Africa Finance Corporation (AFC)

NAME Stock exchanges

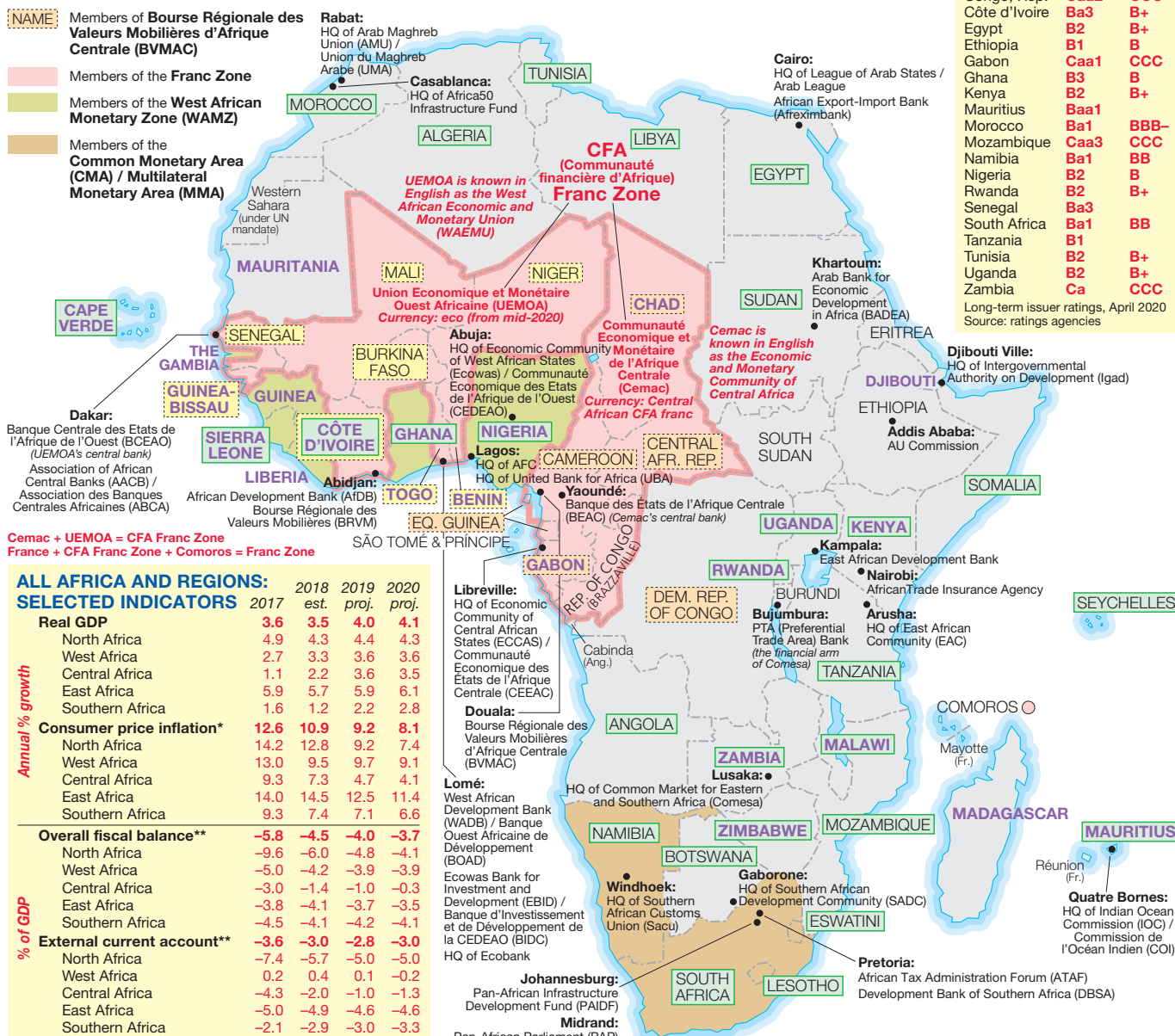
NAME Members of Bourse Régionale des Valeurs Mobilières (BRVM)

NAME Members of Bourse Régionale des Valeurs Mobilières d'Afrique Centrale (BVMAC)

Members of the Franc Zone

Members of the West African Monetary Zone (WAMZ)

Members of the Common Monetary Area (CMA) / Multilateral Monetary Area (MMA)



SOVEREIGN RATINGS

Country	Moody's	Fitch
Angola	B3	B-
Botswana	A2	
Cameroon	B2	B
Congo, D.R.	Caa1	
Congo, Rep.	Caa2	CCC
Côte d'Ivoire	Ba3	B+
Egypt	B2	B+
Ethiopia	B1	B
Gabon	Caa1	CCC
Ghana	B3	B
Kenya	B2	B+
Mauritius	Baa1	
Morocco	Ba1	BBB-
Mozambique	Caa3	CCC
Namibia	Ba1	BB
Nigeria	B2	B
Rwanda	B2	B+
Senegal	Ba3	
South Africa	Ba1	BB
Tanzania	B1	
Tunisia	B2	B+
Uganda	B2	B+
Zambia	Ca	CCC

Long-term issuer ratings, April 2020

Source: ratings agencies

ALL AFRICA AND REGIONS:

SELECTED INDICATORS

	2017	2018 est.	2019 proj.	2020 proj.
Real GDP	3.6	3.5	4.0	4.1
North Africa	4.9	4.3	4.4	4.3
West Africa	2.7	3.3	3.6	3.6
Central Africa	1.1	2.2	3.6	3.5
East Africa	5.9	5.7	5.9	6.1
Southern Africa	1.6	1.2	2.2	2.8
Consumer price inflation*	12.6	10.9	9.2	8.1
North Africa	14.2	12.8	9.2	7.4
West Africa	13.0	9.5	9.7	9.1
Central Africa	9.3	7.3	4.7	4.1
East Africa	14.0	14.5	12.5	11.4
Southern Africa	9.3	7.4	7.1	6.6
Overall fiscal balance**	-5.8	-4.5	-4.0	-3.7
North Africa	-9.6	-6.0	-4.8	-4.1
West Africa	-5.0	-4.2	-3.9	-3.9
Central Africa	-3.0	-1.4	-1.0	-0.3
East Africa	-3.8	-4.1	-3.7	-3.5
Southern Africa	-4.5	-4.1	-4.2	-4.1
External current account**	-3.6	-3.0	-2.8	-3.0
North Africa	-7.4	-5.7	-5.0	-5.0
West Africa	0.2	0.4	0.1	-0.2
Central Africa	-4.3	-2.0	-1.0	-1.3
East Africa	-5.0	-4.9	-4.6	-4.6
Southern Africa	-2.1	-2.9	-3.0	-3.3

Fiscal balance is government income minus spending

*annual average. **including grants.

Source: AfDB, OECD & UNDP, African Economic Outlook 2019

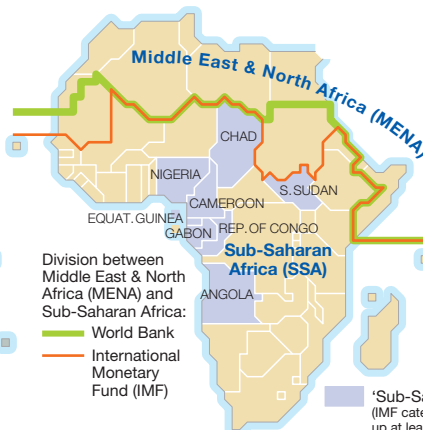
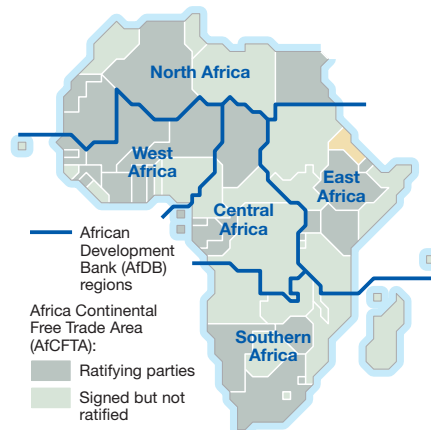
SUB-SAHARAN AFRICA:

SELECTED INDICATORS

	2017	2018	2019 proj.	2020 proj.
Real GDP	3.0	3.2	3.2	3.6
- Oil exporting countries excluding Nigeria	0.5	1.5	2.1	2.5
- Oil importing countries excluding South Africa	-0.2	0.2	1.5	2.4
- Middle-income countries	4.5	4.3	3.9	4.3
- Low-income countries*	6.1	6.0	5.4	5.6
- Countries in fragile situations	2.0	2.3	2.5	2.8
Consumer price inflation**	10.9	8.5	8.4	8.0
Fiscal balance (incl. grants)	-4.6	-3.7	-4.3	-4.3
External current account	-2.3	-2.7	-3.6	-3.8
Reserves (months of imports)	5.0	4.9	4.7	4.6

*excluding low-income countries in fragile situations. **annual average.

Source: IMF, Regional Economic Outlook, Sub-Saharan Africa, Oct 2019



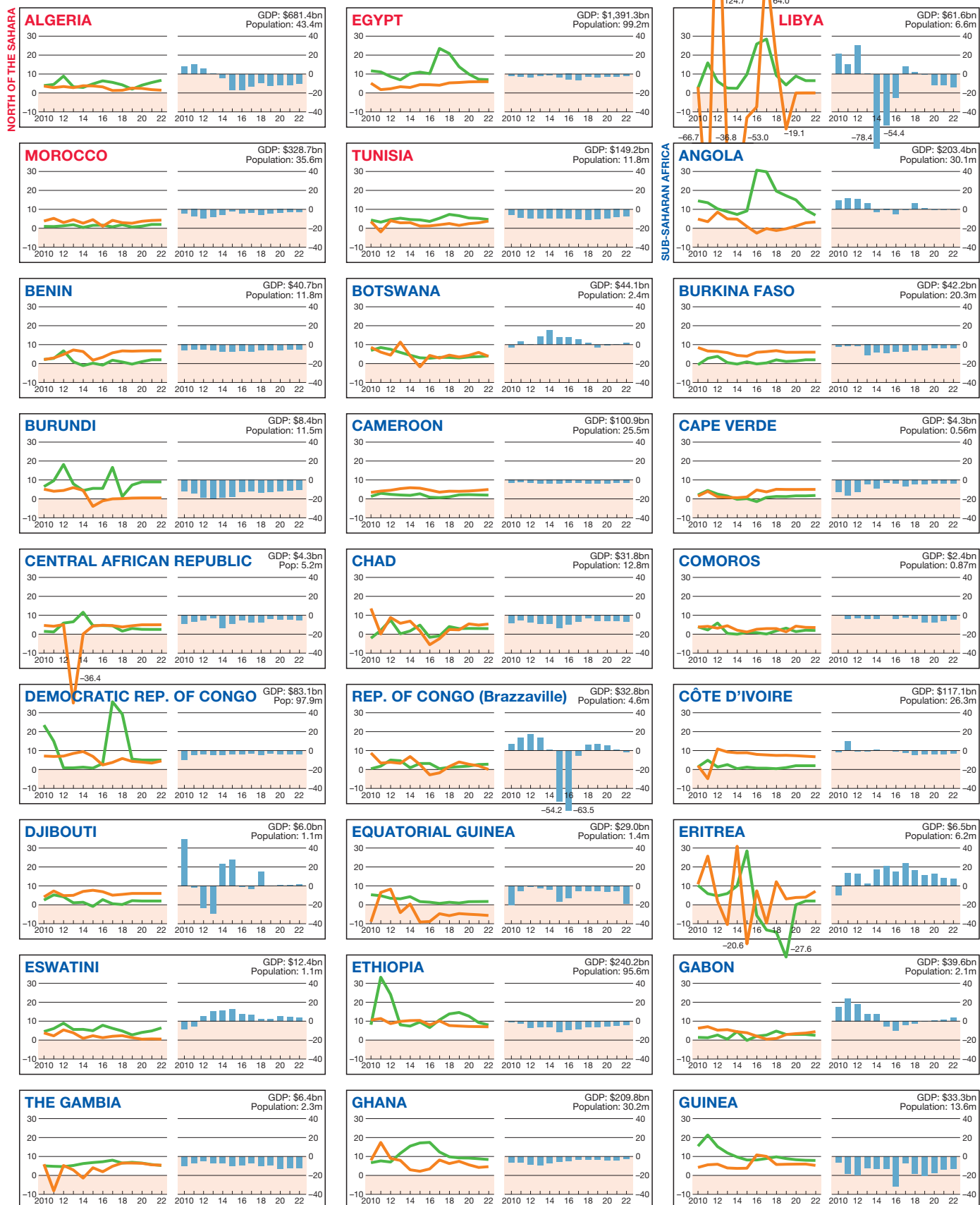
*Sub-Saharan African oil exporters' (IMF category where net oil exports make up at least 30% of total exports)

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Economic indicators by country

- **Gross domestic product** Constant prices (real GDP), percentage change on previous year
- **Consumer price inflation** Percentage change on previous year
- **Current account balance** Percentage of GDP

GDP figures are based on purchasing-power-parity (PPP) valuation of the country's GDP, measured in current international dollars.
GDP and population figures are for 2019.
Some data are IMF estimates, including most data for 2018 and beyond.



TOP AND BOTTOM FIVE COUNTRIES, 2019

Real GDP growth % change

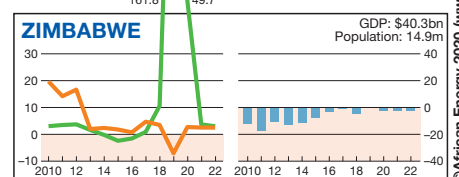
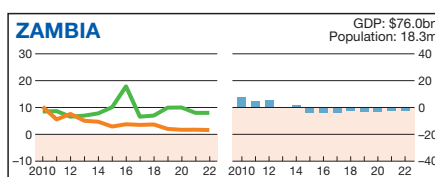
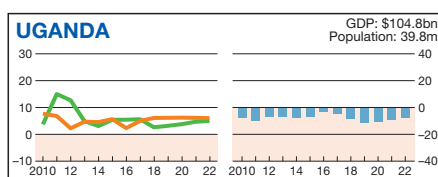
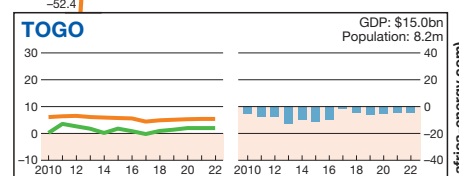
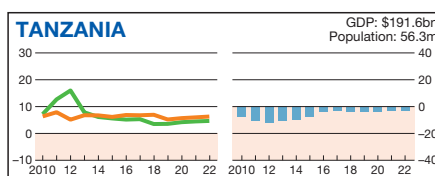
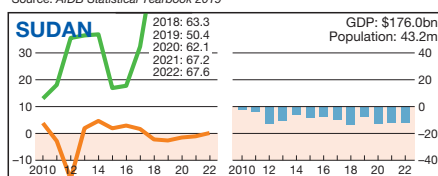
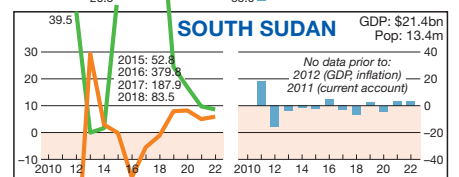
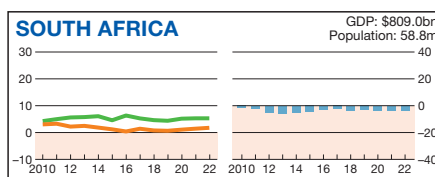
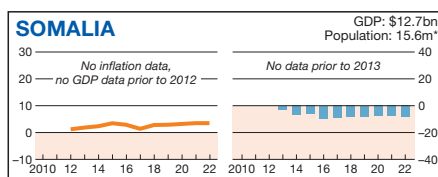
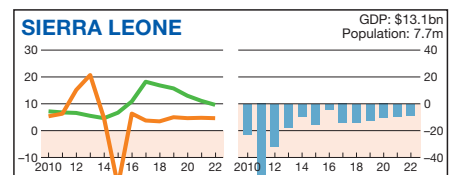
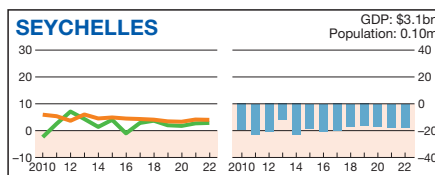
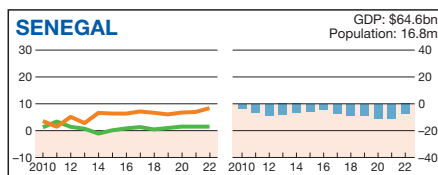
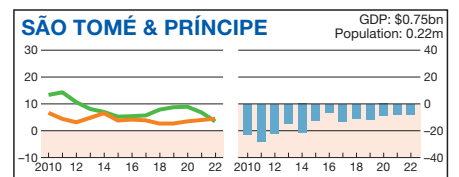
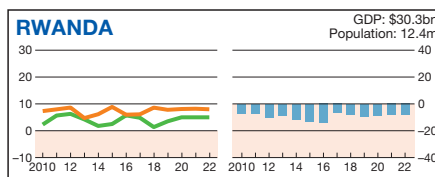
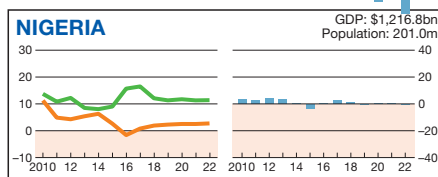
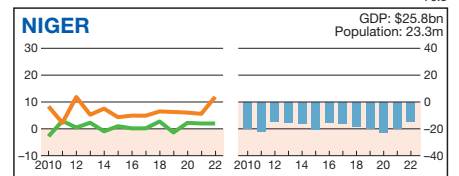
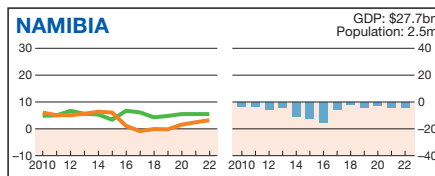
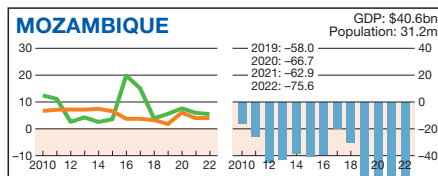
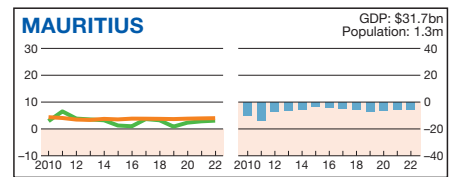
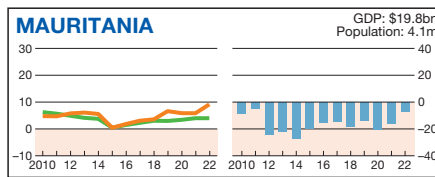
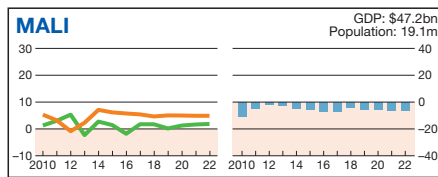
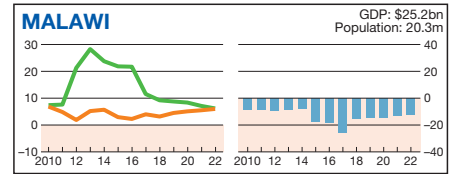
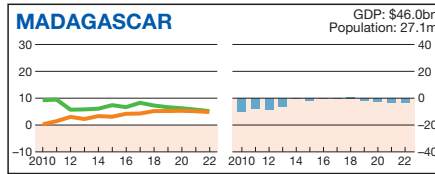
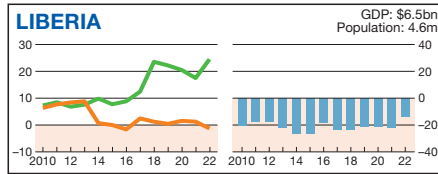
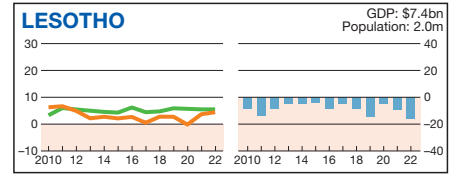
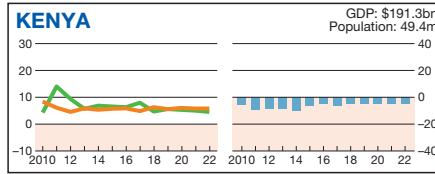
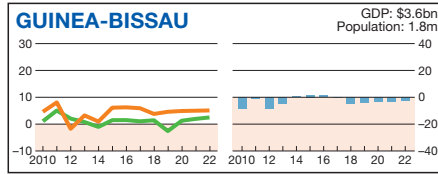
South Sudan 7.9%
Rwanda 7.8%
Côte d'Ivoire 7.5%
Ghana 7.5%
Ethiopia 7.4%

Consumer price inflation % change

Angola -0.3%
Sudan -2.6%
Equatorial Guinea -4.6%
Zimbabwe -7.1%
Libya -19.1%

Current account balance % of GDP

Eritrea 11.3%
Republic of Congo 6.8%
eSwatini 2.5%
South Sudan 2.3%
Angola 0.9%



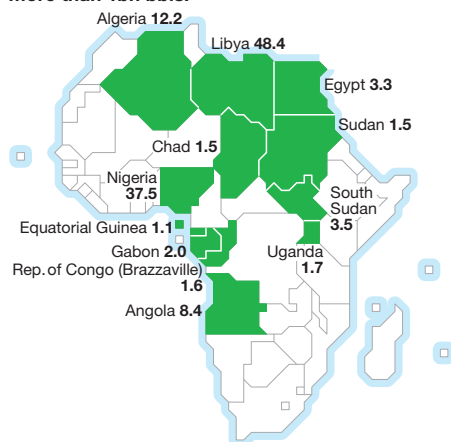
*Source: AfDB Statistical Yearbook 2019

Key trends: Reserves, production, consumption & exports

PROVED OIL RESERVES, end-2018

Billion barrels
Total: 125.3bn bbls (7.2% of world reserves)

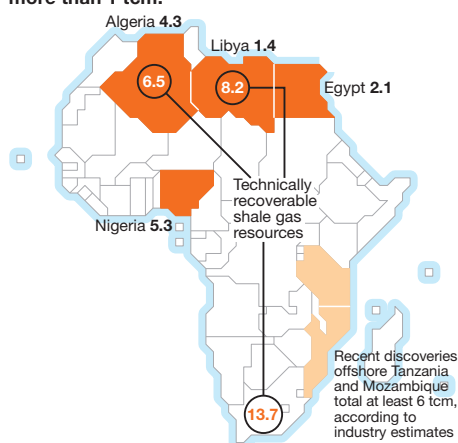
Countries with proved reserves of more than 1bn bbls:



PROVED NATURAL GAS RESERVES, end-2018

Trillion cubic metres
Total: 14.4 tcm (7.3% of world reserves)

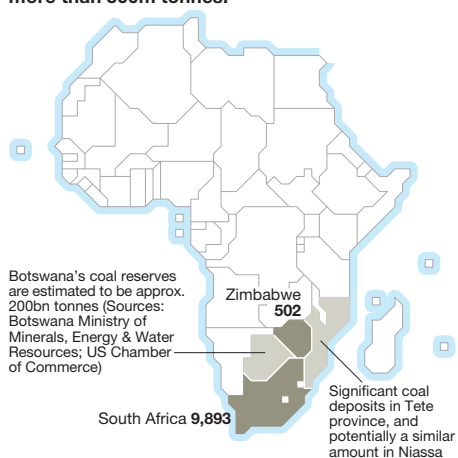
Countries with proved reserves of more than 1 tcm:



PROVED COAL RESERVES, end-2018

Million tonnes
Total: 13,217m tonnes (1.2% of world reserves)

Countries with proved reserves of more than 500m tonnes:

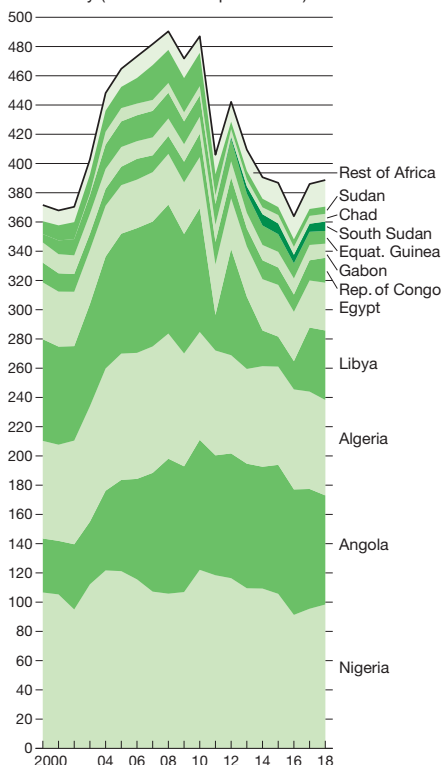


Sources: BP Statistical Review of World Energy, June 2019; US Energy Information Administration (2011), World Shale Gas Resources: An Initial Assessment
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OIL PRODUCTION

Million tonnes
2000 total: 371.6m tonnes / 7,789 thousand barrels/day (10.4% of world production)

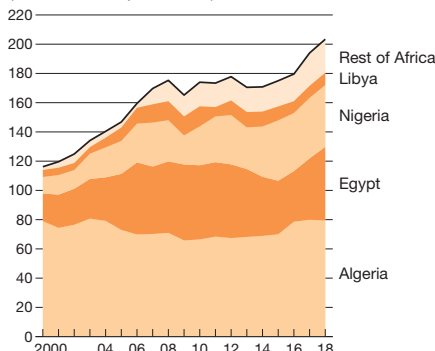
2018 total: 388.7m tonnes / 8,193 thousand barrels/day (8.7% of world production)



GAS PRODUCTION

Million tonnes oil equivalent
2000 total: 116.2m toe / 135.1 billion cubic metres (5.6% of world production)

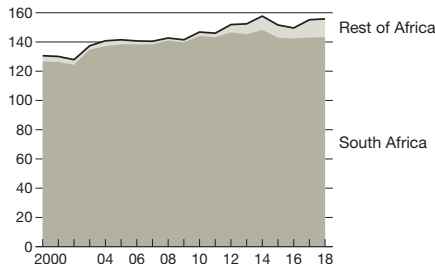
2018 total: 203.4m toe / 236.6 billion cubic metres (6.1% of world production)



COAL PRODUCTION

Million tonnes oil equivalent
2000 total: 130.5m toe (5.7% of world production)

2018 total: 155.8m toe (4.0% of world production)



HYDROELECTRIC POWER CONSUMPTION

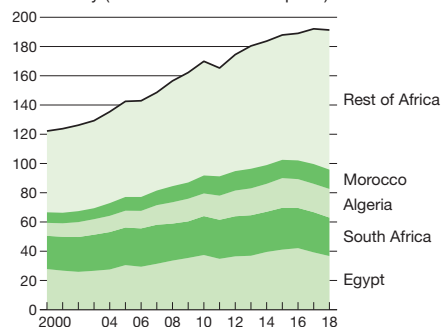
2000 total: 17.0m tonnes oil equivalent (2.8% of world)

2018 total: 30.1m toe (3.2% of world)

OIL CONSUMPTION

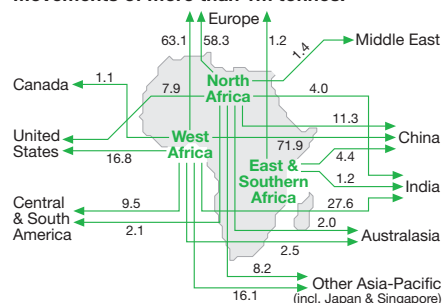
Million tonnes oil equivalent
2000 total: 122.2m toe / 2,465 thousand barrels/day (3.2% of world consumption)

2018 total: 191.3m tonnes / 3,959 thousand barrels/day (4.1% of world consumption)



CRUDE OIL FROM AFRICA, 2018

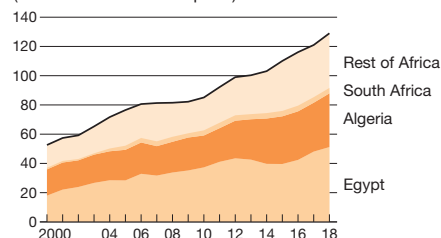
Movements of more than 1m tonnes:



GAS CONSUMPTION

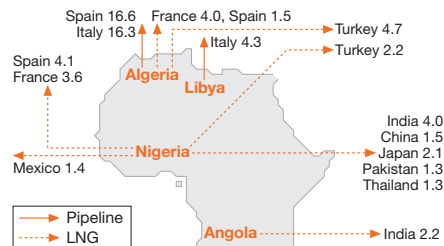
Million tonnes oil equivalent
2000 total: 47.9m toe / 55.7 billion cubic metres (2.3% of world consumption)

2018 total: 129.0m toe / 150.0 billion cubic metres (3.9% of world consumption)



GAS FROM AFRICA, 2018

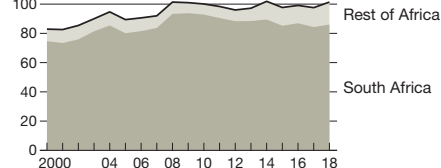
Movements of more than 1 bcm:



COAL CONSUMPTION

Million tonnes oil equivalent
2000 total: 82.8m toe (3.5% of world consumption)

2018 total: 101.4m toe (2.7% of world consumption)



NUCLEAR POWER CONSUMPTION

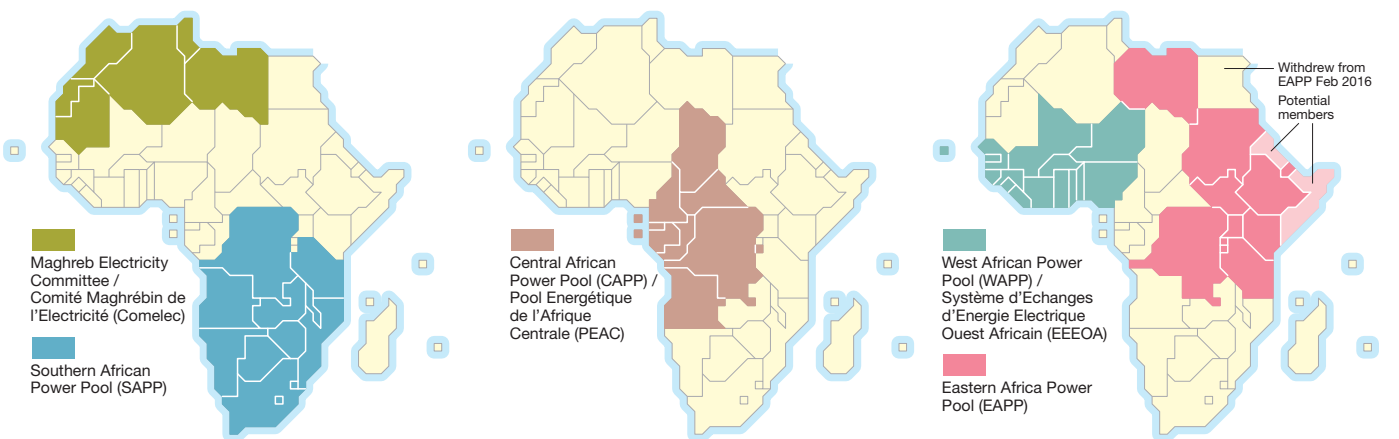
2000 total: 2.9m toe (0.5% of world)

2018 total: 2.5m toe (0.4% of world)

NATIONAL POWER COMPANIES



REGIONAL POWER POOLS



Africa's multiple energy transitions start to bear fruit

The many energy transitions slowly taking place in Africa have begun to make an impact on the ground. As well as the move to lower carbon generation, these include transitions to private financing of the power sector, to a focus on transmission and distribution, and to a mix of grid and isolated systems

A number of energy transitions have begun to move from market buzz to on-the-ground activity at a notable scale. The changes are throwing up new challenges that indicate the next transitions on the continent, as governments look for ways around payment guarantees and find that the only solutions are sustainable utilities or more open markets, while work on regional trading is starting to make this more possible.

Africa's transitions cannot be seen in isolation. The change of focus from generation to transmission and distribution comes as several countries find that they no longer have a shortage of supply but of demand. Weak grids, high losses, low access and consumption, and expensive power continue to suppress markets. Ghana claims to have excess supply, but in December 2019, off-grid generator Genser Energy raised \$366m to build a large gas pipeline network to supply its expanding captive power plants. These plants supply power to mines that are connected to the grid but whose quality of supply is so poor they are looking elsewhere. Kenya faces a similar situation where supply appears to have outstripped demand at the same time as per capita electricity consumption is below the African average and off-grid solar home systems are installed beneath Kenya Power's distribution lines.

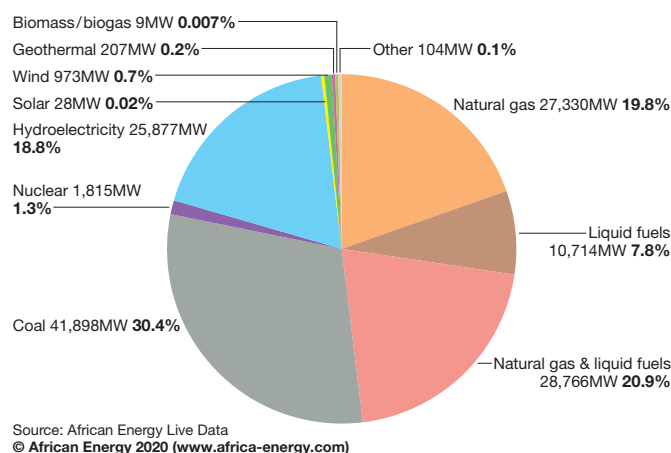
One solution has been to invest in transmission and distribution. Kenya's last-mile connection programme has increased access while a transmission line to the west of the country currently supplied by Uganda is expected to end the supply surplus. Private investment in transmission is being seriously explored in the country by both the World Bank Group's International Finance Corporation and the Africa50 infrastructure fund. At the same time, interconnections are being planned or built across East Africa that will increase the potential market and help countries balance demand and supply without suppressing investment or demand or drastically increasing the cost of power.

Solar progress

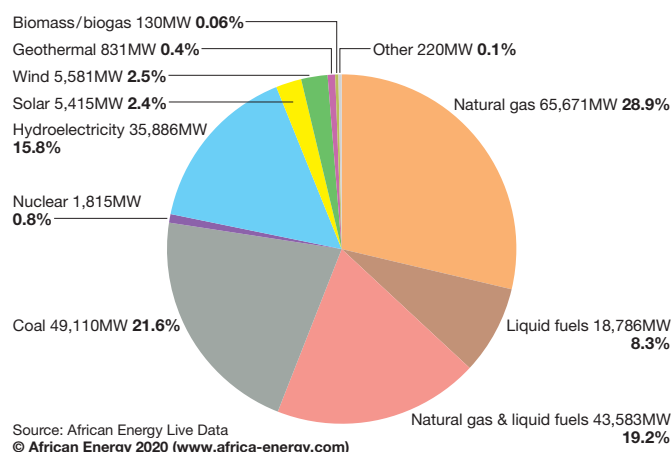
Solar power is proving an increasingly useful technology for Africa. Prices have come down to the extent that solar can be used to displace most fossil fuels, reducing Africa's foreign exchange exposure. Solar systems can be small and can be located close to demand or where the grid is best able to evacuate the power. Requiring limited logistics, solar is very suitable for small and poorer countries. It can be used off-grid or hybridised with thermal plants to reduce costs or hydropower plants to help manage water levels. There are also abundant funding options and numerous developers, while the industry is helped by a very low construction failure rate and a track record of generally limited construction delays and cost over-runs. This has made solar power an easy decision for African governments.

An increasing number of intermittent generation plants as well as weak grids have resulted in the first utility-scale battery projects being contemplated. Morocco has made major strides with recent procurements of large solar and battery systems. South Africa's Eskom is considering a major programme and potential developers showed strong interest in storage in a recent request for information looking for short-term options to mitigate the country's power crisis. Senegal is investigating a large battery project and recently brought online its first utility-scale renewable power and battery plant. Countries like Namibia are looking at battery systems and there are also proposals in Kenya. A number of renewable energy-plus-battery projects are being considered in smaller countries where networks are unable to handle intermittent energy.

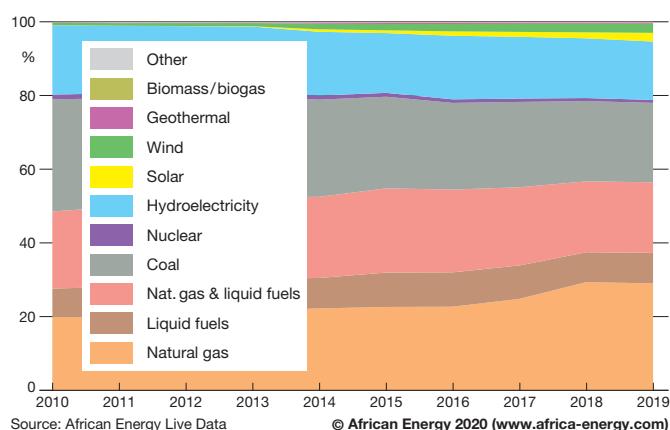
AFRICA'S ON-GRID ENERGY MIX, 2010
Total: 137,721MW



AFRICA'S ON-GRID ENERGY MIX, Q1 2020
Total: 227,028MW



ON-GRID GENERATION CAPACITY BY FUEL, 2010-19



Market moves

Cheap renewables have also started to provide a spur for the nascent development of markets. In Namibia, the modified single buyer model is largely based on solar power, which is cheap enough to make it attractive to purchase as an alternative to the grid. The decision to develop solar and wind projects as IPPs in South Africa has combined with the financial crisis at Eskom to push the government towards sector unbundling.

The need to account for the system cost of renewables – which result in other plants being used less frequently and therefore becoming more expensive – is pushing countries like Namibia and Kenya to introduce more clarity into their tariffs and power purchase agreements about the various costs involved in supplying power. This, in turn, is creating the potential for new markets for power grid services.

The transition to private sector development alongside the greater use of renewable power is having a clear impact – H1 2019 saw the lowest additions of new generation capacity in nearly a decade. This is partly the result of insufficient grid demand in key markets. Another factor is that, although government policy has switched to privately financed generation, weak utility finances and limited policy implementation mean that, while new state utility-built capacity has declined in many countries, private investment has not increased sufficiently to plug the gap.

This is a marked change from previous years. For the first time more generation capacity was added by the private sector than by state utilities (1.5GW v 1.2GW) in H1 2019, according to *African Energy Live Data*. In the whole of 2018, 14.2GW was added by state utilities compared with 3.1GW by the private sector. The difference was even more dramatic in 2017, with only 1.4GW added by the private sector but 11.6GW by the state. The shift to solar was clear as more solar capacity was added than any other technology in H1 2019, with 917MW.

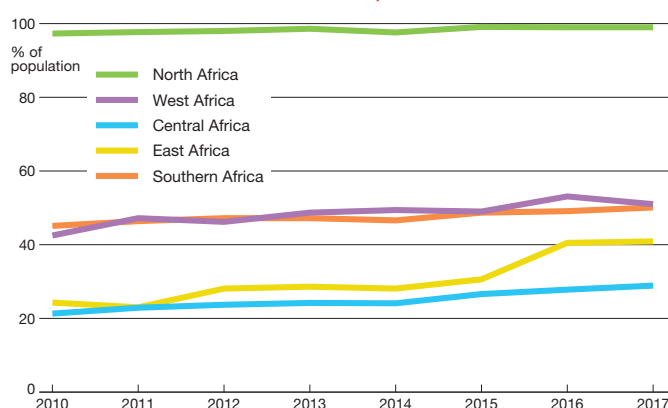
The increase in private capacity coupled with the weakness of utilities and increasing levels of government debt has resulted in several larger governments questioning support given to IPPs. Most notable are larger countries like Ghana, Kenya, Nigeria and

South Africa. All four are looking for alternatives to government guarantees or support agreements. Kenya is again looking to dilute its letter of support – which the government provides instead of a payment guarantee – in light of the collapse of the Kinangop project, when the government called in its letter of support following delays caused by land issues. Ghana has lashed out at private developers and is attempting to renegotiate tariffs and change thermal capacity payments from take-or-pay to take-and-pay. South Africa is giving strong hints that it will not provide government guarantees for future IPP procurement and Nigeria's Treasury has been reluctant to provide further guarantees since the Azura-Edo gas power project. Azura-Edo was Nigeria's first fully privatised IPP to reach financial close in December 2015, but no IPPs have closed since then.

Meanwhile, Ghana, Nigeria and South Africa are all struggling with the fallout of failed or inadequate reform policies, which makes ending government guarantees difficult. This was epitomised in 2019 by the failed concessioning of the Electricity Company of Ghana, the catastrophic collapse of Eskom, and threat by the Nigerian Electricity Regulatory Commission to cancel distribution concessions as a result of failure to make minimum payments to the Nigerian Bulk Electricity Trader. Both Ghana and South Africa are likely to require support from international donors to resolve the financial crises facing their utilities.

Other countries have emerged as more forward thinking. Zambia has engaged Africa GreenCo as a creditworthy intermediary off-taker between struggling utility Zesco and the country's IPPs. GreenCo will be able to supply industrial off-takers and ultimately the Southern Africa Power Pool in the event of non-payment by Zesco, as well as having recourse to guarantee schemes from KfW and the African Trade Insurance Agency. Namibia is looking to the domestic and then regional market to reduce sector risk. NamPower is moving towards a role as generator of last resort and transmission and market operator with the establishment of the modified single buyer model. Côte d'Ivoire's cash waterfall mechanism, which sees the private utility operator CI-Energies, IPPs and gas suppliers paid before other expenses, continues to pay dividends after major expansions to the Ciprel and Azito gas power plants reached financial close in early 2020.

ELECTRICITY ACCESS BY REGION, 2010-17



North Africa anticipates shift from gas to renewables

The evolution of electric power generation in North Africa has reached a tipping point, with Morocco close to meeting its first major renewable energy target and the end of a five-year trend of massive gas-fired power procurement across the region

The shift from gas to renewables and the associated commercial challenges will directly affect both North Africa's wider energy sector and economic performance in general. Morocco's 2009 National Energy Strategy set a target of 42% renewable power by 2020. Although this will not be met, it is close. According to *African Energy Live Data*'s current snapshot of the project pipeline, just over 37% of power will be generated by renewables by year-end, rising to just under 40% in 2021.

By 2022, the target will be substantially exceeded. If mooted changes go ahead to the 13-09 procurement law, under which most private sector wind and solar projects are being developed, a significant number of plants that currently do not have expected commissioning dates could improve the picture dramatically.

Ahead of the COP22 climate change meeting in Marrakech in 2016, Morocco added a further target of reaching 52% of renewables capacity by 2030. This will require an acceleration in renewables commissioning to keep pace with a new wave of gas-fired plants linked to long-term import plans and the development of domestic production. The Jorf Lasfar, Dhar Doum and Al-Wahda gas-fired plants (each expected to have 1.2GW installed capacity), were originally planned for 2021 but along with a regasification terminal have been postponed until the end of the decade.

Similarly, no gas-fired power plants are expected to start construction in the rest of the region for the next several years. In Egypt, Cairo Electricity Production Company's 650MW Cairo West extension project is expected to start production in 2020. After that, no large-scale gas-fired plant is envisaged in the current five-year plan to 2022. While some additional plants are on the drawing board for the following five years, it is far from certain they will be built. By 2028, the Dabaa nuclear plant is expected to have added 4.8GW of baseload capacity. Additionally, there is no way of reliably divining how much renewable capacity may have been commissioned by that point.

Part of the difficulty for Egyptian power sector planners is that by end-2019 the system had achieved a reserve capacity of 83%, meaning there is no need to build more. The authorities are encouraging private sector offers for renewables projects but have insisted on very low power purchase agreement (PPA) prices. The subtext is that developers and financiers have to take what they are offered.

The involvement of a large number of counterparties in the massive Benban solar park in southern Egypt, which was fully commissioned in 2019, has created a diverse ecosystem of project sponsors, consultants, financiers, engineers and equipment

suppliers, all keen to embark on new schemes. Whether they will or not partly depends on how strictly the ministry sticks to its challenging price requirements but also on other factors, such as how rapidly inefficient thermal plants are decommissioned.

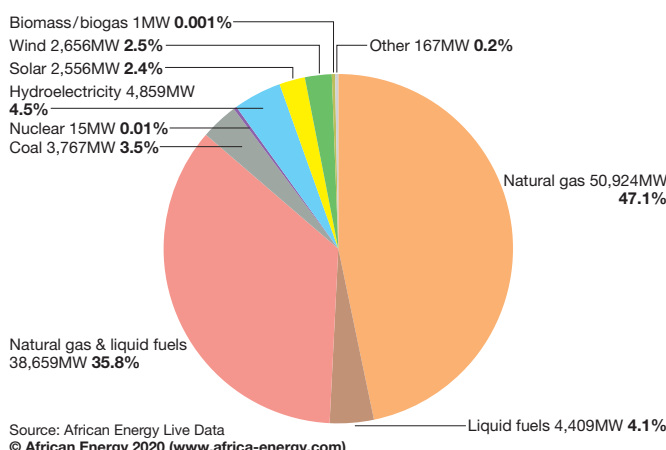
Another huge strategic decision due in 2020 is the privatisation of one or more of the three 4.8GW gas-fired plants built by Siemens. Any new private sector owners will have to sign fresh PPAs with Egyptian Electricity Transmission Company. The government may want a high sale price or a low PPA price. This decision may affect what commercial terms apply elsewhere.

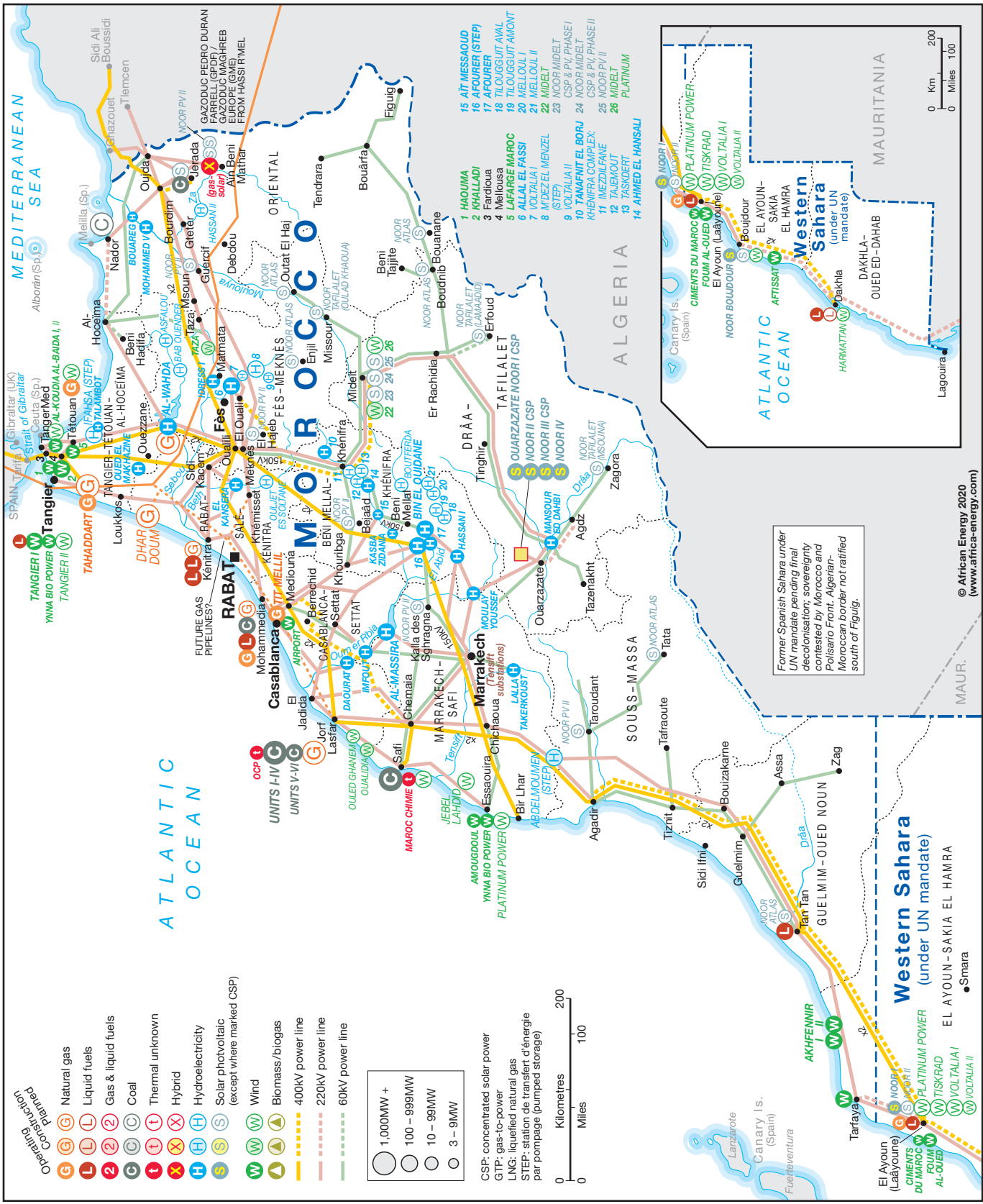
Meanwhile, in Algeria, all of the 8GW of gas-fired power plants that Sonelgaz ordered from GE in 2013 were all still at various stages of construction in early 2020, with most of them expected to be completed by 2021, although more delays are possible. After that, the development of further gas-fired generation is limited to the 1.3GW Umashe plant, which Hyundai Engineering & Construction is due to deliver in 2025. Based as it is on a questionable strategy of developing a domestic solar panel construction industry, Algeria's renewables programme is in the doldrums.

Tunisia is pushing ahead with wind and solar schemes but no new gas-fired generation will be built once the combined-cycle gas turbine unit of the 450MW Rades C gas plant and the 650MW Mornaguia plant are completed in 2020 and the 450MW Skhira plant in 2021.

Beleaguered Libya desperately needs more power generation but until the political and security environment improves it is struggling to complete existing projects, while budget constraints mean that finding finance for new projects is also hard.

NORTH AFRICA'S ON-GRID ENERGY MIX, Q1 2020
Total: 108,013MW





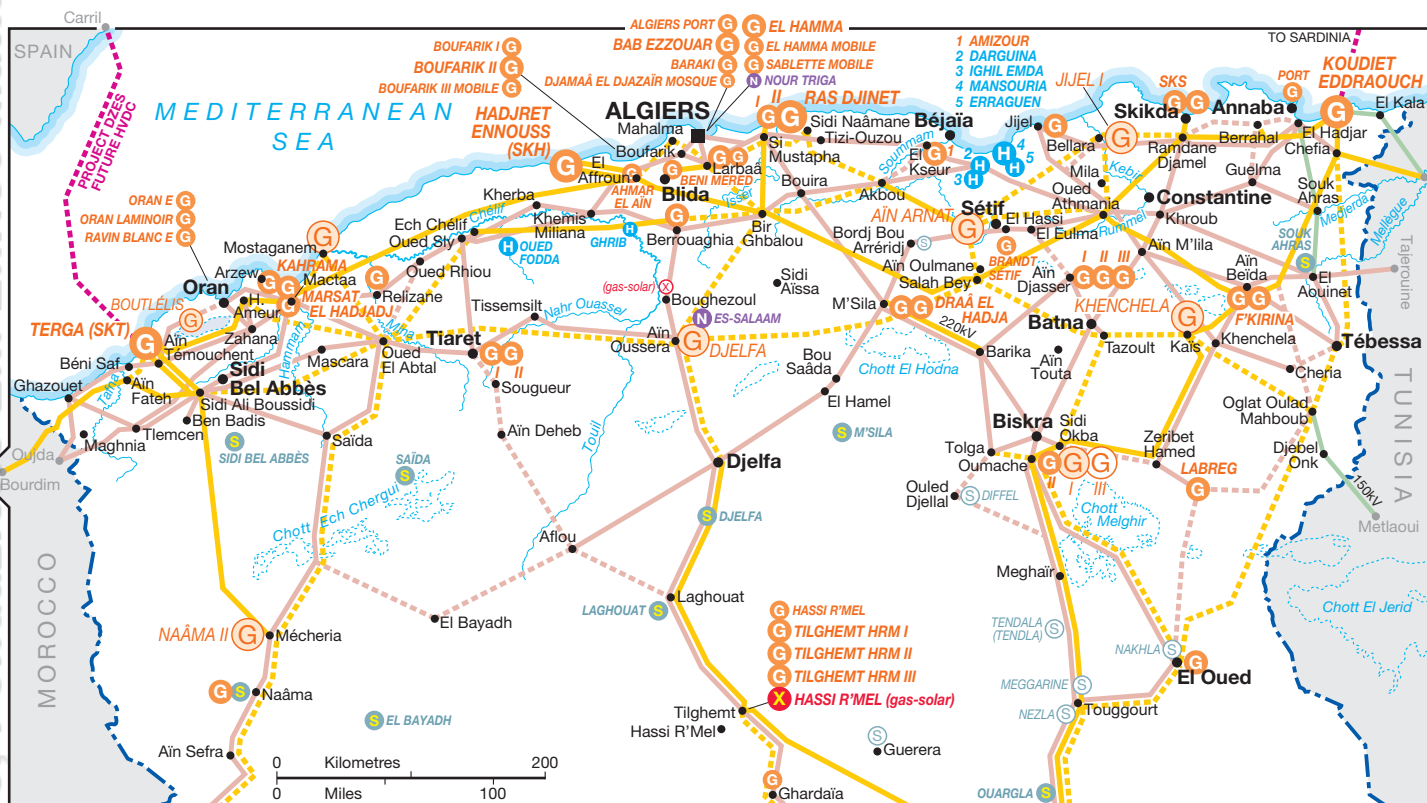
Plants/projects	Capacity (MW)
Operating	9,838
Construction	1,033
Planned*	3,350

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Access to electricity (2017, millions)	
Population	34.85
Those with access	34.85
% with access	100

Sources: SEforALL; IMF

Algeria



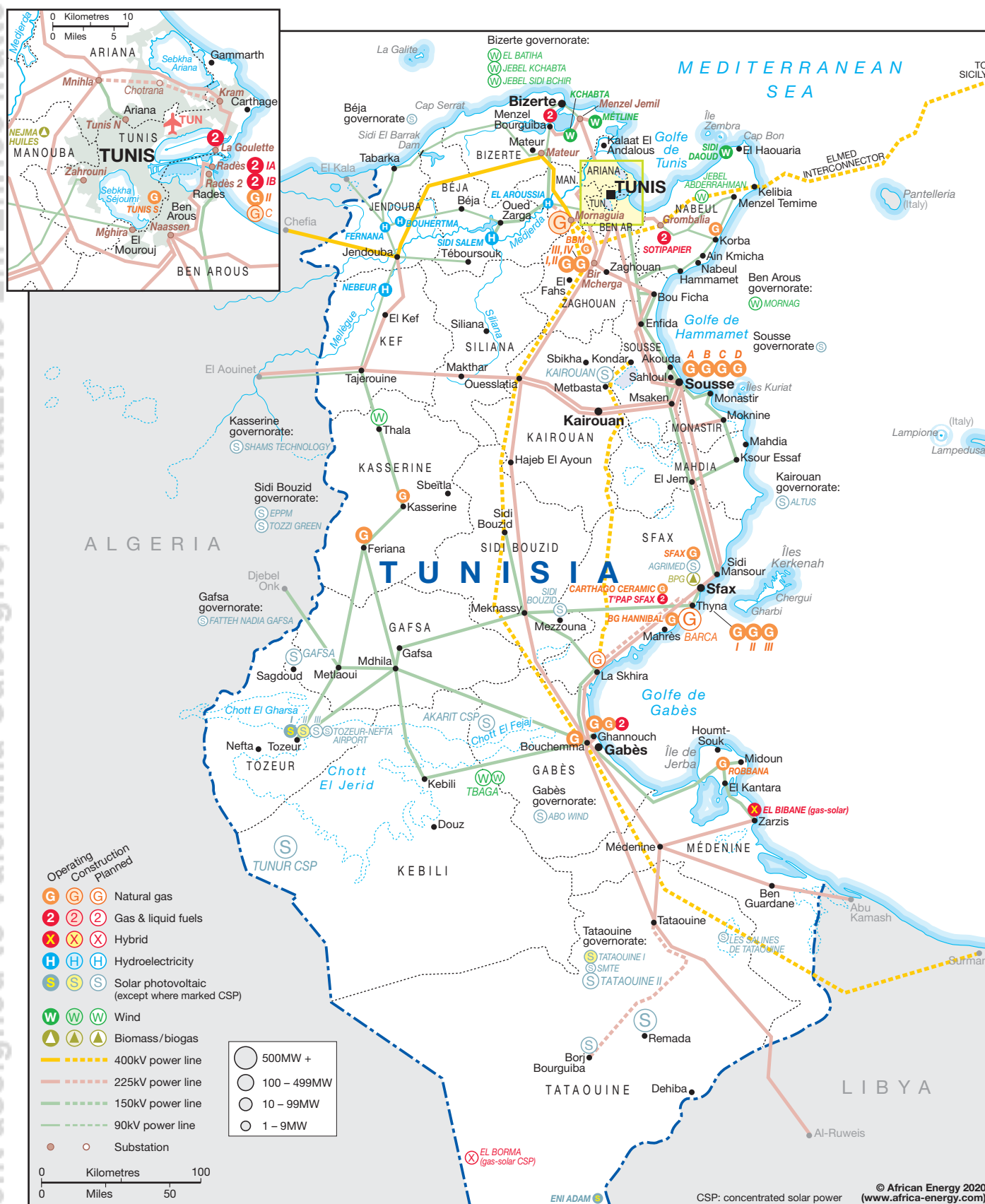
Plants/projects	Capacity (MW)
Operating	22,023
Construction	9,143
Planned*	1,350

Access to electricity (2017, millions)

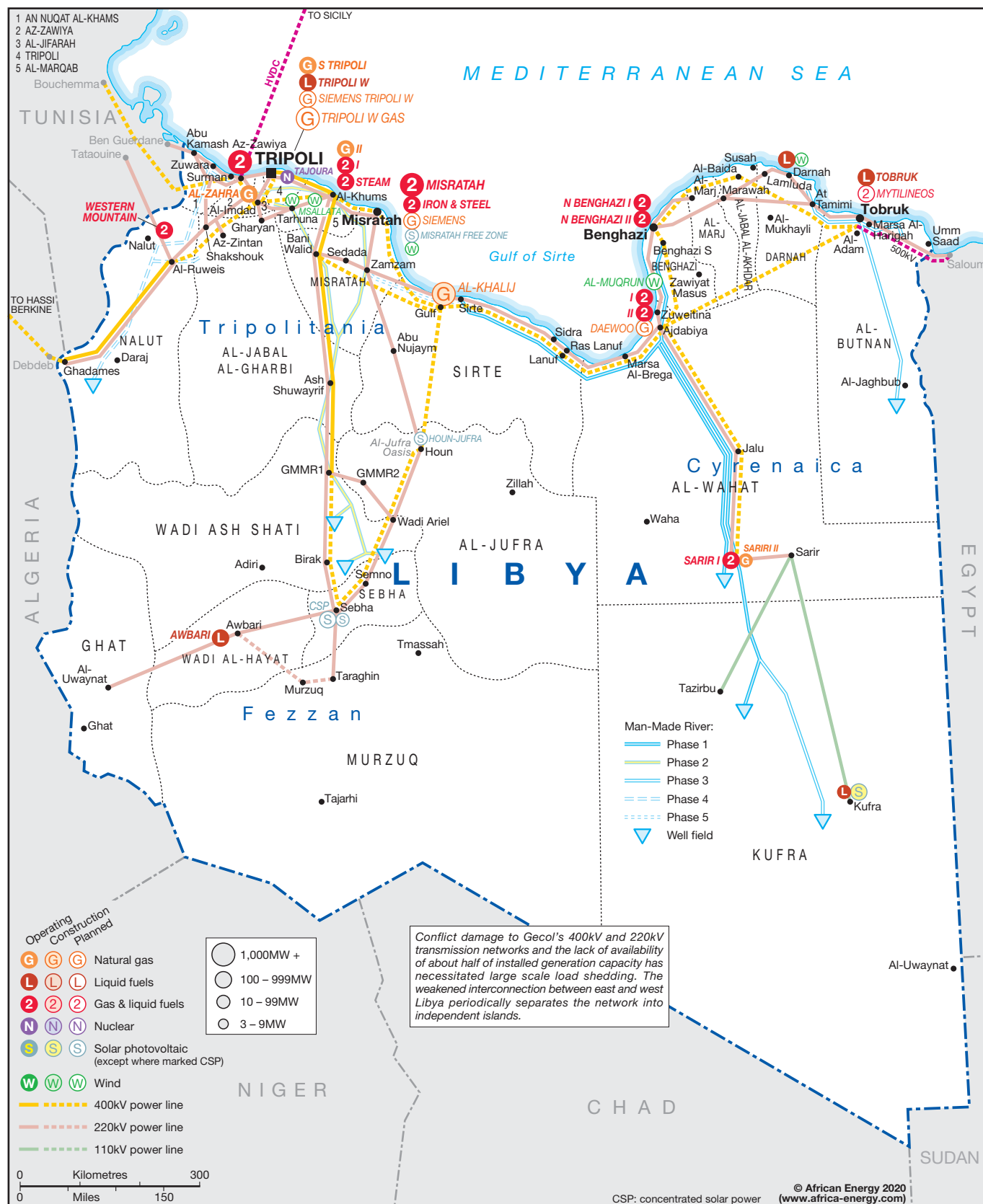
Population	41.72
Those with access	41.72
% with access	100

Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF



Libya



Plants/projects	Capacity (MW)
Operating	10,702
Construction	1,470
Planned*	0

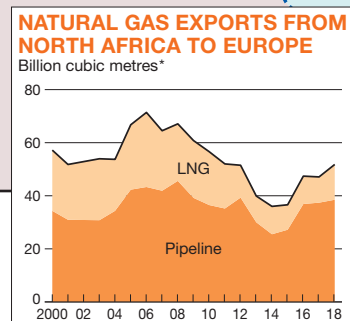
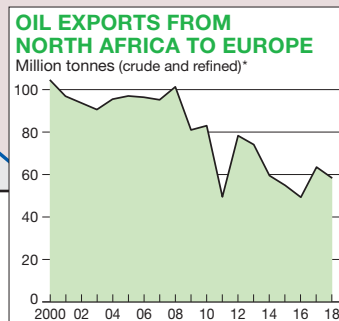
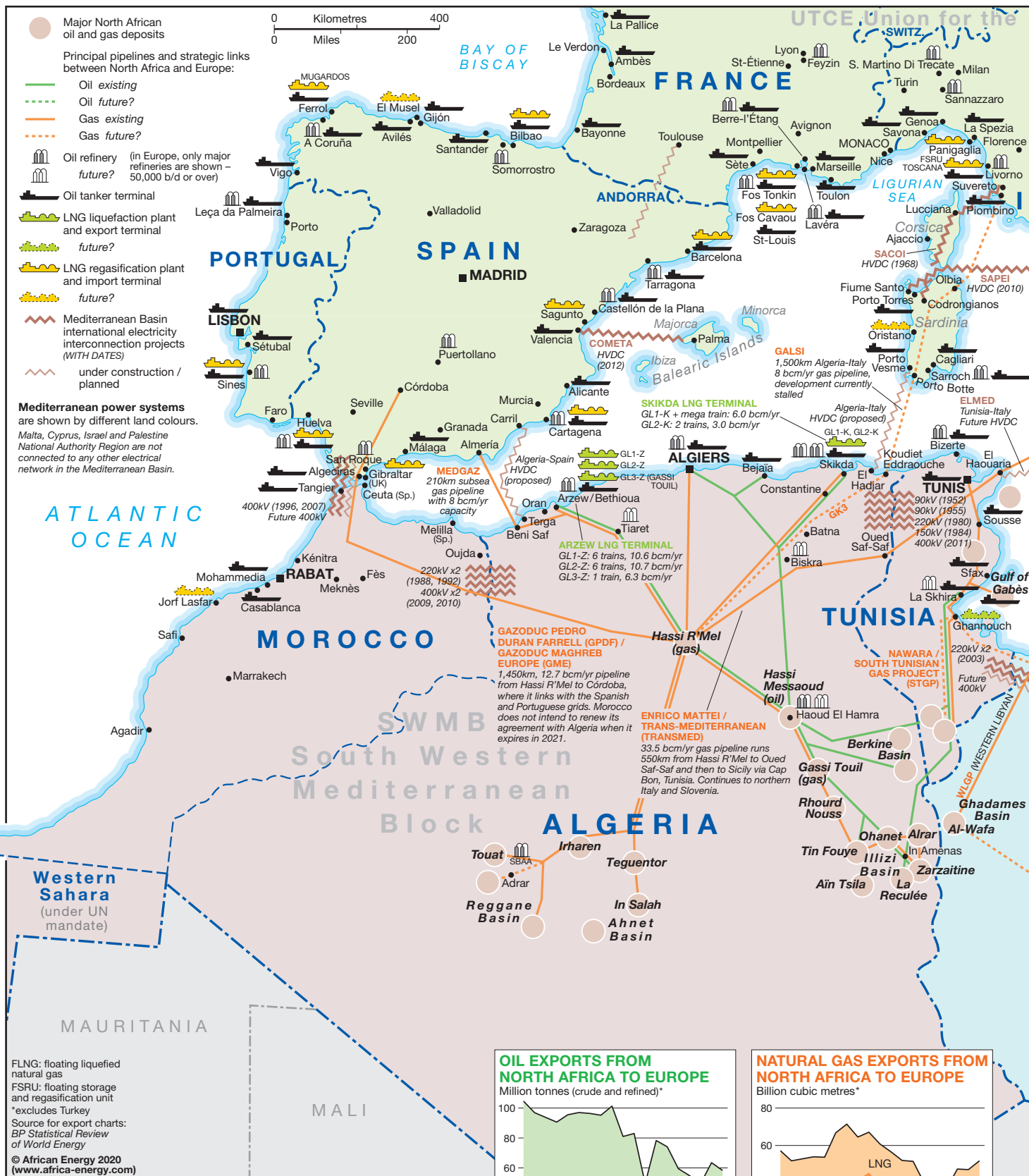
Access to electricity*	Libya	Egypt
Population	6.45	94.8
Those with access	4.52	94.8
% with access	70	100

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.

* 2017, millions. Sources: SeforALL; IMF



The Mediterranean Basin



Source: African Energy Live Data, April 2020. www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.



New markets emerge in sub-Saharan Africa as more mature markets stagnate

Power sectors in sub-Saharan Africa are in the grip of change. Smaller markets are starting to reap the benefits of recent reforms while more mature markets are running out of road as a result of policy failures. The energy transition and move to private sector financing in the sector are having a major impact

Many sub-Saharan African countries stand to benefit from the small scale and comparatively simple construction and logistics of solar power. The introduction of affordable battery storage promises to extend these benefits still further. Malawi is making slow but definite progress with the procurement of four solar plants through a competitive tender in 2016, two of which have reached financial close. The International Finance Corporation (IFC) is developing the 350MW Mpatamanga hydro project and has begun tendering for a strategic investor, and Malawi is developing an interconnection with Mozambique.

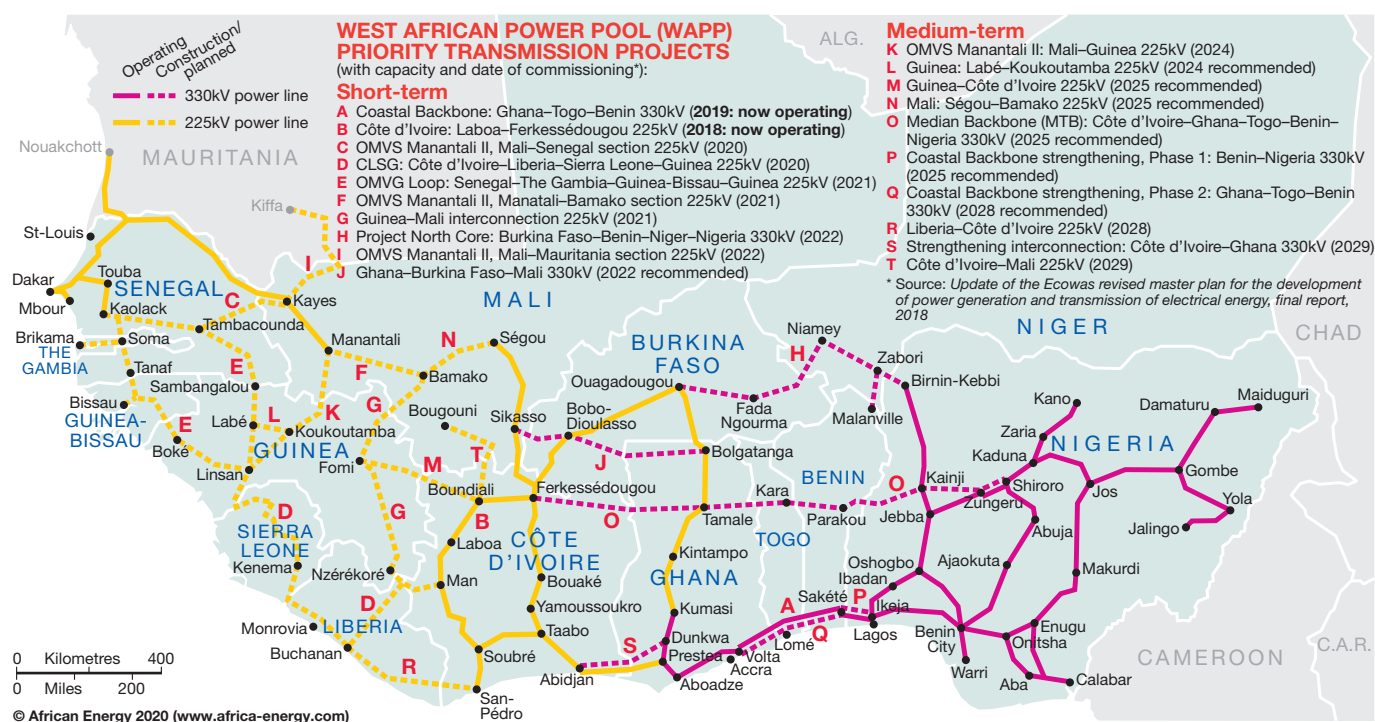
Other frontier markets are not far behind, with serious endeavours to put in place the complex frameworks required for IPP procurement. Mali now has several IPPs operating or at an advanced stage of development, Burundi has its first IPP under construction, and Madagascar is procuring power although there are increasing problems with payments from utility Jiro sy Rany Malagasy (Jirama). Chad is also making efforts to develop projects. Liberia and Sierra Leone have struggled recently to maintain their early momentum but developers in both countries remain engaged, despite some projects changing hands.

Ethiopia and Angola have emerged as major potential markets for private investment, although both come with significant

challenges. In Ethiopia, substantial progress has been made putting in place a viable public-private partnership framework and improving the investor environment. However, the market suffered a setback when four bidders were disqualified following a rule change during the first round of the World Bank's Scaling Solar programme in September 2019. The country remains a top priority for many donors and private interest has not yet waned. Both countries have highly disruptive foreign exchange environments. Angola suffered from the 2014 oil price crash, but has made important reforms, and a model power purchase agreement in 2019 was well received. The country has significant gas and renewable power potential.

Senegal has become something of a pioneer for private power development, with 17 projects in operation or construction according to [African Energy Live Data](#), amounting to nearly 1GW capacity. These include the second largest wind power project in sub-Saharan Africa, which is already partially operational. To help stabilise the grid, the government is looking at a major battery storage project, which may be financed by the World Bank or privately. The disastrous 125MW Sendou coal power project does not appear to have set the country back.

Electricidade de Moçambique (EdM) has received plaudits for its decision to focus on transmission and distribution, leaving



generation to the private sector. Having negotiated a number of gas and solar IPPs that are now under development or operating, the utility has begun to move towards competitive procurement of new capacity. More programmes are expected, with KfW's Global Energy Transfer Feed-in Tariff programme and an IFC initiative both in the pipeline. Mozambique has also put in place an electrification structure designed to sustain increases in access while reducing the financial burden for EdM.

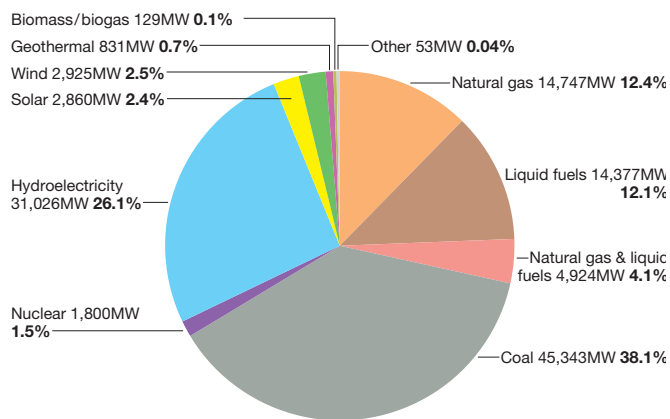
The off-grid industry continues to expand and deepen its presence on the continent. The technology has matured to the point of entering the national planning of many countries, encouraged by the World Bank, which has been funding geospatial mapping to assist with least-cost electrification. Other donors are also stepping up their activities. In the solar home system sector, donors have moved away from providing equity – which is increasingly provided by large institutional investors and oil and gas majors – and debt – where commercial banks are becoming involved – and towards funding subsidy schemes and capacity building for governments.

Mini-grids have become significantly more prevalent without becoming more profitable. Regulation continues to cause problems, but with donors and governments convinced mini-grids will form an important part of meeting electrification goals, this is likely to be resolved over time. Capital subsidies are being considered in a number of countries, having been implemented in Tanzania. Tenders in Sierra Leone and Togo for large numbers of sites are likely to be replicated across the continent.

At the other end of the scale, LNG import schemes have tip-toed rather than hurtled forwards. French major Total has adopted an aggressive strategy, promoting schemes in Benin and Mozambique using existing infrastructure such as the West African Gas Pipeline and the Rompco pipeline, though the more traditional strategy of using a large anchor power plant as the offtaker has struggled to take off. South Africa was the most likely country to use this approach, having both the demand and economic clout to attract the necessary investment, although the capacity of local financial institutions to fund the projects was always somewhat in question.

SUB-SAHARAN AFRICA'S ON-GRID ENERGY MIX, Q1 2020

Total: 119,015MW



Source: African Energy Live Data
© African Energy 2020 (www.africa-energy.com)

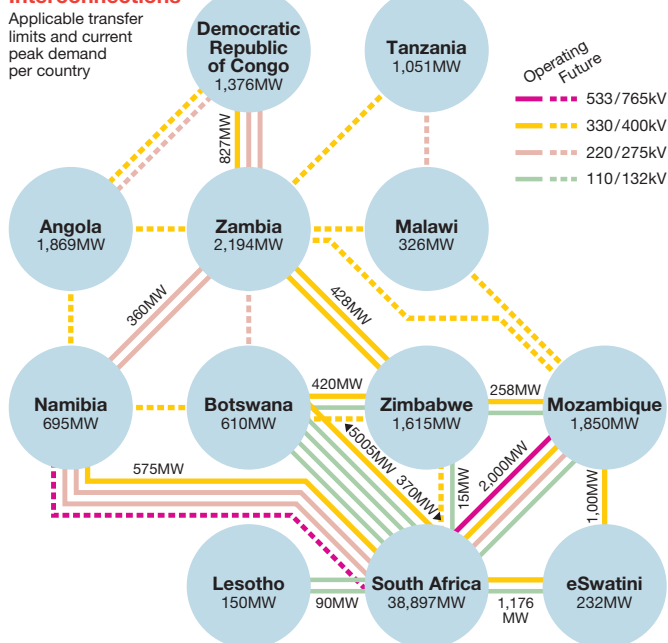
SOUTHERN AFRICAN POWER POOL

Members

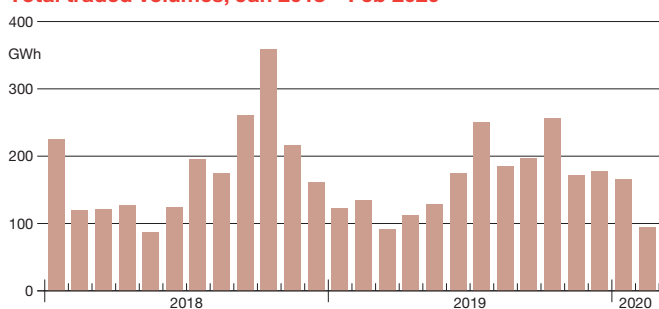
Name	Abbreviation	Type	Country
Botswana Power Corporation	BPC	NPC	Botswana
Copperbelt Energy Corporation	CEC	ITC	Zambia
Electricidade de Moçambique	EDM	ITC	Mozambique
Electricity Supply Corporation of Malawi	Escom	NPC	Malawi
Eskom	–	NPC	South Africa
Eswatini Electricity Company	EEC	NPC	eSwatini
Hidroelétrica de Cahora Bassa	HCB	IPP	Mozambique
Lesotho Electricity Company	LEC	NPC	Lesotho
Lunsemfwa Hydro Power Company	LHPC	IPP	Zambia
Mozambique Transmission Company	Motraco	ITC	Mozambique
Namibia Power Company	NamPower	NPC	Namibia
Ndola Energy Company Limited	NECL	IPP	Zambia
Rede Nacional de Transporte de Electricidade	RNT	NPC	Angola
Société Nationale d'Electricité	Snel	NPC	Dem. Rep. of Congo
Tanzania Electric Supply Company	Tanesco	NPC	Tanzania
Zesco	–	NPC	Zambia
Zimbabwe Electricity Supply Authority	Zesa	NPC	Zimbabwe

IPP: Independent power producer ITC: Independent transmission company
NPC: National power company

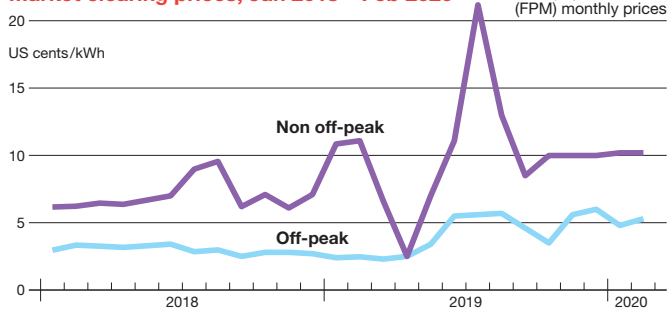
Interconnections



Total traded volumes, Jan 2018 – Feb 2020

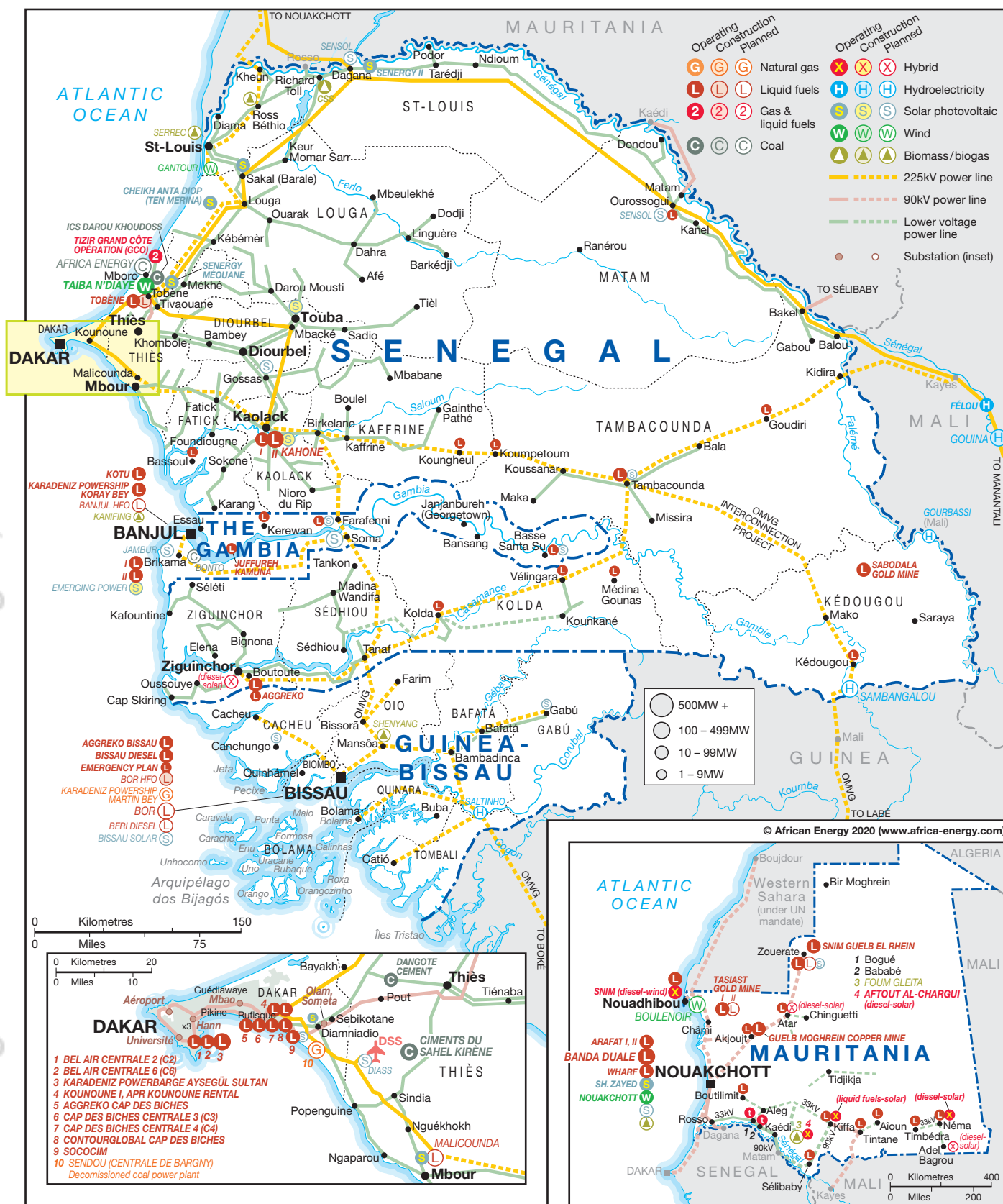


Market clearing prices, Jan 2018 – Feb 2020



Source: Southern Africa Power Pool (SAPP) © African Energy 2020 (www.africa-energy.com)

Senegal, Mauritania, The Gambia, Guinea-Bissau



Capacity (MW)	Senegal	Mauritania	Gambia	Guinea-B
Operating	1,484	554	137	33
Construction	316	11	30	15
Planned*	235	190	161	36

Access to electricity*	Senegal	Mauritania	Gambia	Guinea-B
Population	15.85	4.42	2.1	1.7
Those with access	9.83	1.9	1.18	0.44
% with access	62	43	56	26

Source: African Energy Live Data, April 2020. www.africa-energy.com/database

* Projects with a planned commercial operation date of 2025 or earlier.

*2017, millions. Sources: SEforALL; IMF

Guinea, Sierra Leone, Liberia, Cape Verde

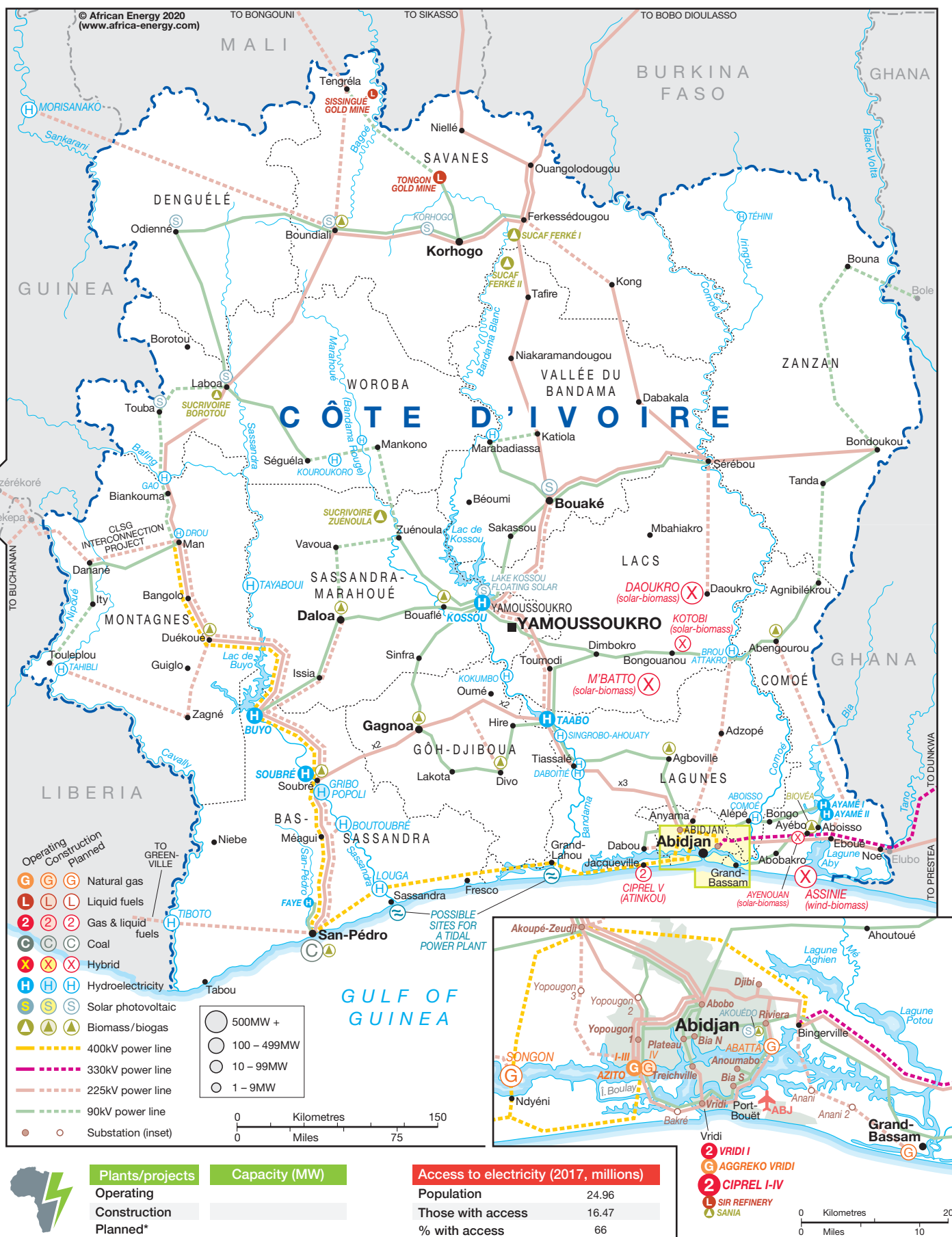


Capacity (MW)	Guinea	Sierra Leone	Liberia	Cape Verde	Access to electricity*	Guinea	Sierra Leone	Liberia	Cape Verde
Operating	830	235	155	235	Population	12.97	7.41	4.35	0.55
Construction	800	6	0	0	Those with access	4.54	1.70	0.91	0.51
Planned*	238	237	12	41	% with access	35	23	21	93

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.

* 2017, millions. Sources: SeforALL; IMF

Côte d'Ivoire





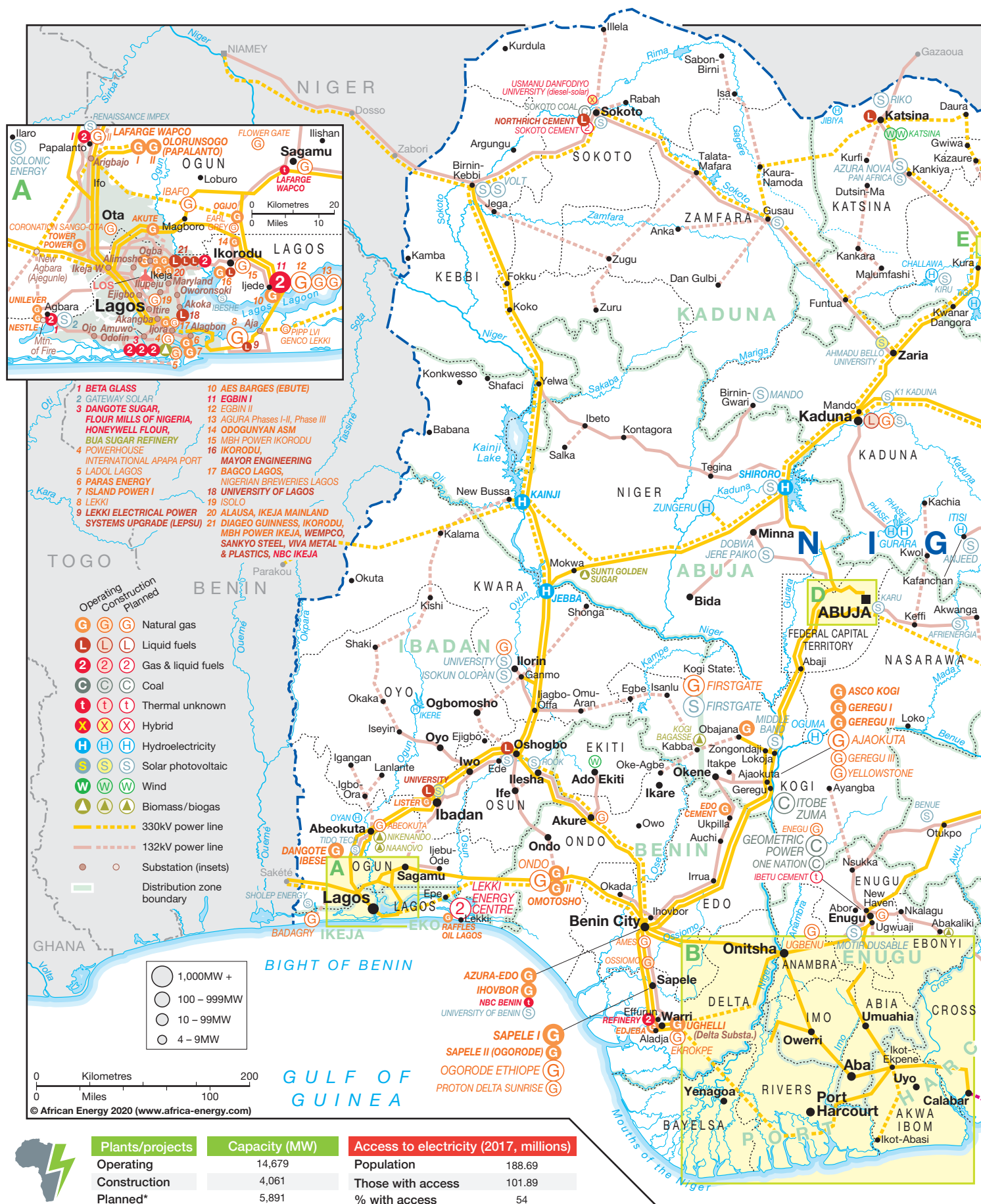
Capacity (MW)	Ghana	Togo	Benin
Operating	5,310	170	226
Construction	555	309	0
Planned*	1,515	70	45

Access to electricity*	Ghana	Togo	Benin
Population	28.94	7.8	11.13
Those with access	22.86	3.74	4.79
% with access	79	48	43

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

* 2017, millions. Sources: SEforALL; IMF

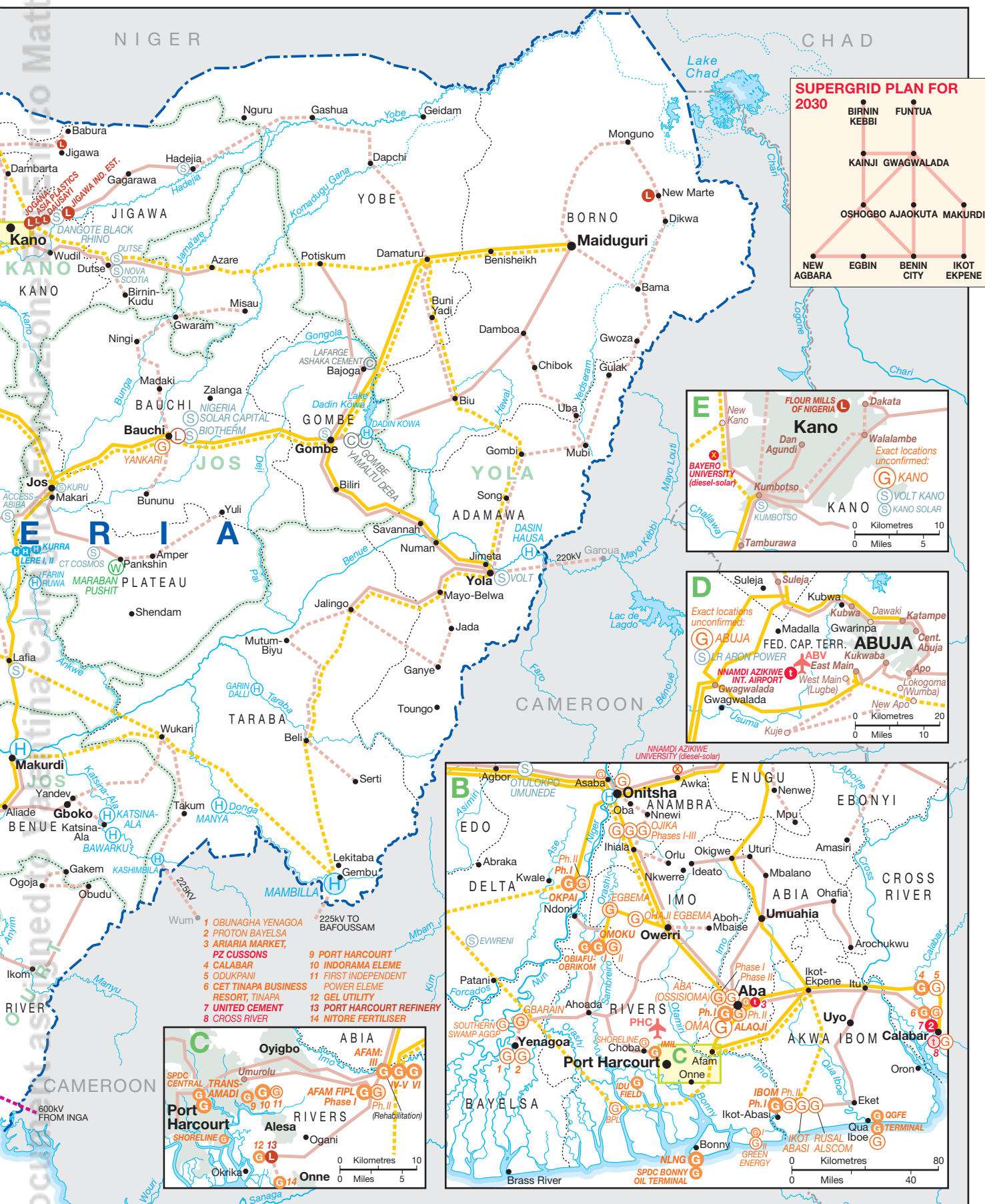
Nigeria



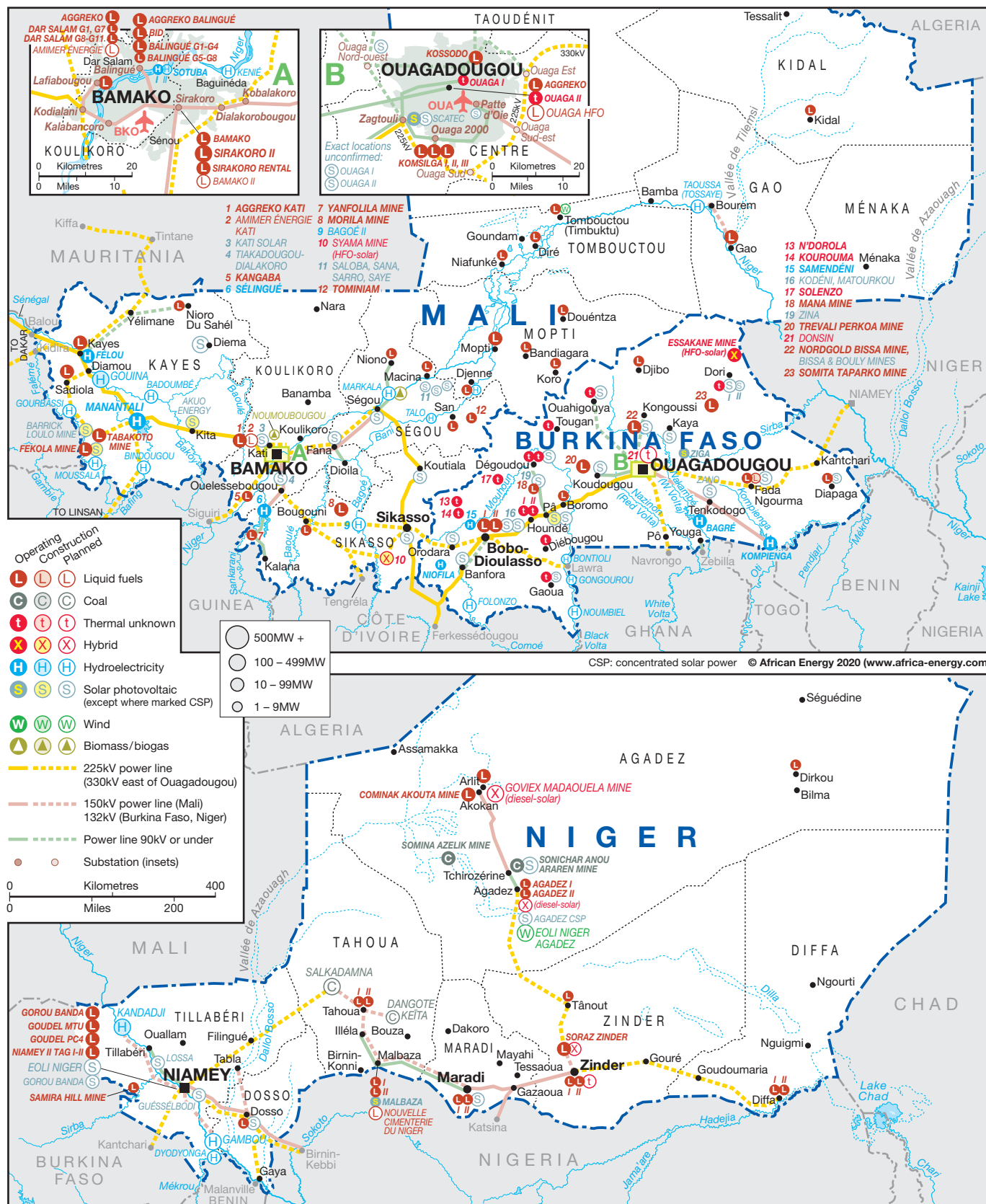
Source: African Energy Live Data, April 2020.

* Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF



Mali, Burkina Faso, Niger



	Capacity (MW)	Mali	Burkina Faso	Niger	Access to electricity*	Mali	Burkina Faso	Niger
Operating		902	568	322	Population	18	19.19	18.76
Construction		297	43	130	Those with access	7.74	4.80	3.75
Planned*		222	161	0	% with access	43	25	20

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.

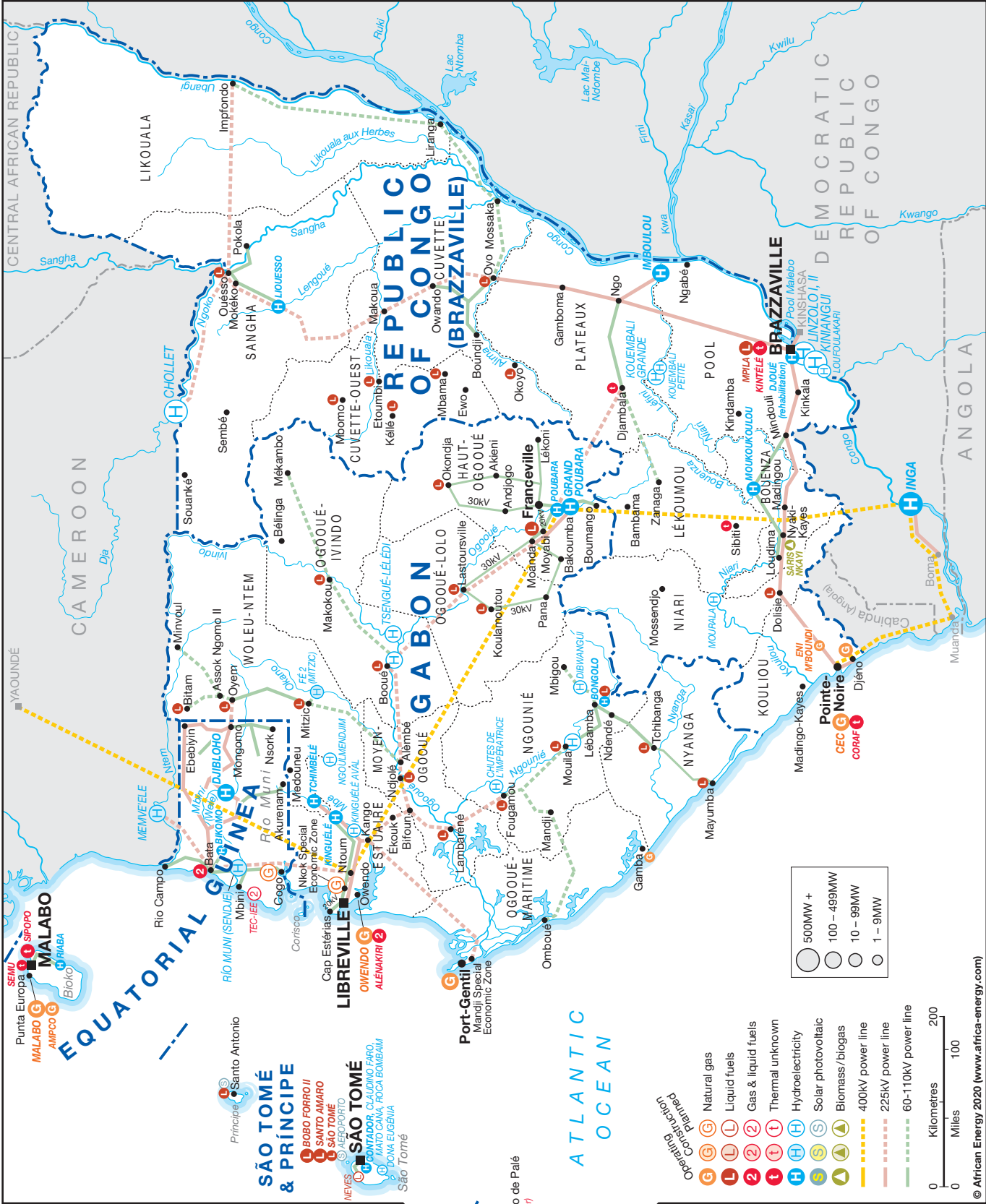
* 2017, millions. Sources: SEforALL; IMF



Access to electricity*	Cameroon	CAR	Chad
Population	24.28	4.98	12.19
Those with access	14.81	1.49	1.34
% with access	61	30	11

* 2017, millions. Sources: SEforALL; IMF

Rep. of Congo, Gabon, Equatorial Guinea, São Tomé & Príncipe



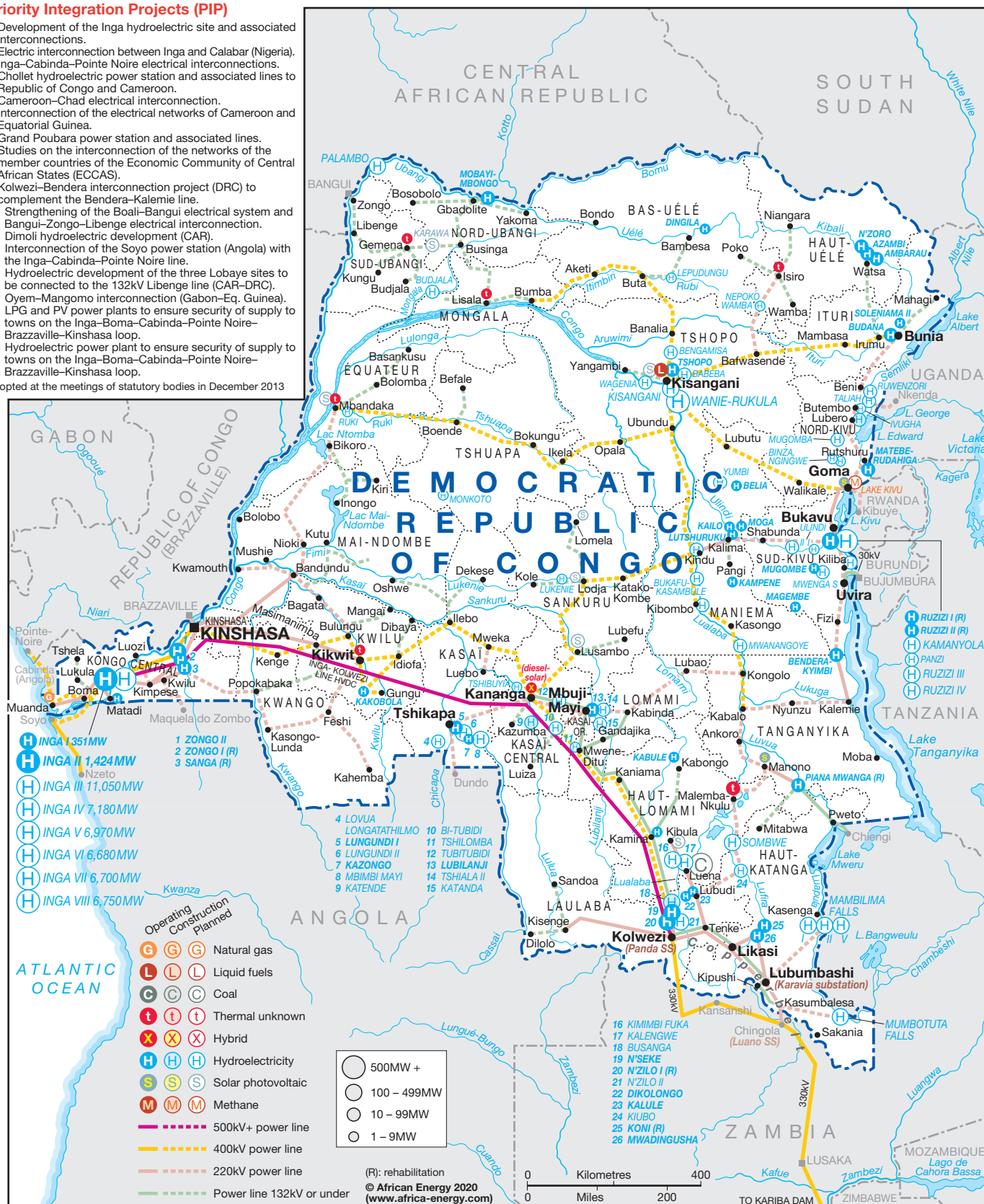
	Capacity (MW)	Rep of Congo	Gabon
Operating		846	766
Construction		0	39
Planned*		0	35

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

	Equatorial Guinea	São Tomé & Príncipe
Operating	353	39
Construction	200	0
Planned	0	0

- 1 Development of the Inga hydroelectric site and associated interconnections.
- 2 Electric interconnection between Inga and Calabar (Nigeria).
- 3 Inga-Cabinda-Pointe Noire electrical interconnections.
- 4 Chollet hydroelectric power station and associated lines to Republic of Congo and Cameroon.
- 5 Cameroon-Chad electrical interconnection.
- 6 Interconnection of the electrical networks of Cameroon and Equatorial Guinea.
- 7 Grand Poubara power station and associated lines.
- 8 Studies on the interconnection of the networks of the member countries of the Economic Community of Central African States (ECCAS).
- 9 Kolwezi-Bendera interconnection project (DRC) to complement the Bendera-Kalemie line.
- 10 Strengthening of the Boali-Bangui electrical system and Bangui-Zongo-Libenge electrical interconnection.
- 11 Dimoli hydroelectric development (CAR).
- 12 Interconnection of the Soyo power station (Angola) with the Inga-Cabinda-Pointe Noire line.
- 13 Hydroelectric development of the three Lobaye sites to be connected to the 132kV Libenge line (CAR-DRC).
- 14 Oyem-Mangomo interconnection (Gabon-Eq. Guinea).
- 15 LPG and PV power plants to ensure security of supply to towns on the Inga-Boma-Cabinda-Pointe Noire-Brazzaville-Kinshasa loop.
- 16 Hydroelectric power plant to ensure security of supply to towns on the Inga-Boma-Cabinda-Pointe Noire-Brazzaville-Kinshasa loop.

Adopted at the meetings of statutory bodies in December 2013



Access to electricity*	
Population	7.86
Those with access	5.74
% with access	73.03

Plants/projects	Capacity (MW)
Operating	2,492
Construction	365
Planned*	227

Access to electricity*	
Population	92.26
Those with access	17.53
% with access	19

* Rep. of Congo, Gabon, Eq Guinea, STP, 2017, millions.
Sources: SEforALL; IMF

* Projects with a planned commercial operation date of 2025 or earlier.

* DR Congo, 2017, millions.
Sources: SEforALL; IMF

Sudan, South Sudan



Capacity (MW)	Sudan	South Sudan
Operating	4,241	60
Construction	0	2
Planned*	536	20

Access to electricity*	Sudan	South Sudan
Population	40.78	12.59
Those with access	22.84	3.15
% with access	56	25

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

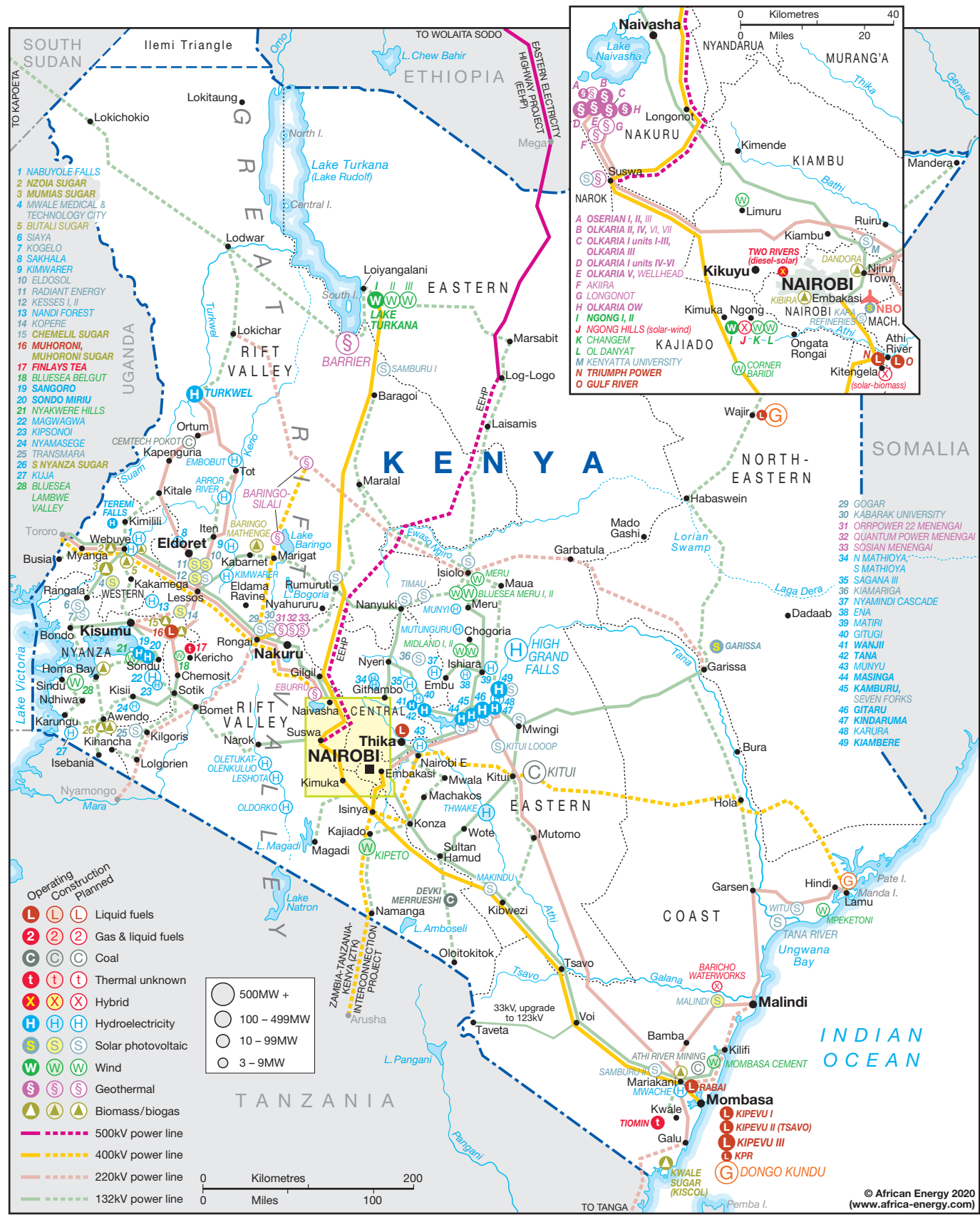
* 2017, millions. Sources: SEforALL; IMF





Access to electricity (2017, millions)	
Population	37.67
Those with access	8.29
% with access	22

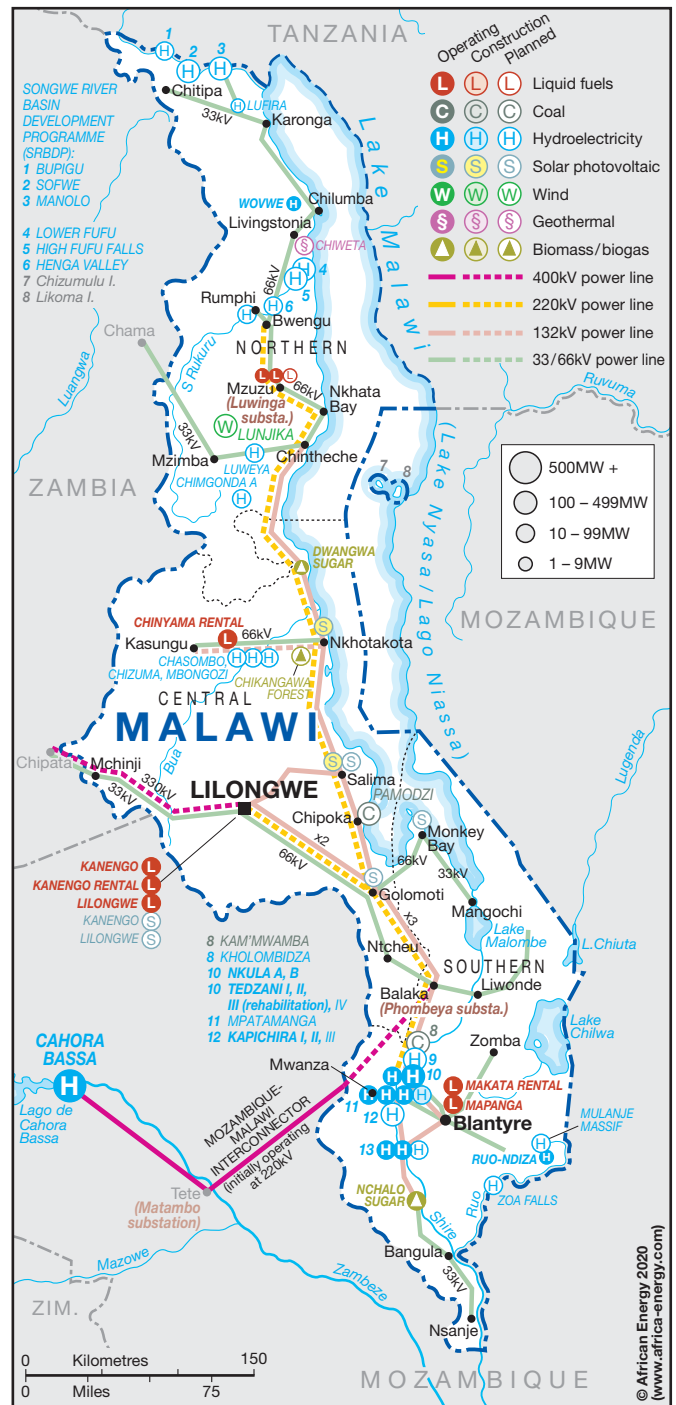
Sources: SEforALL; IMF



Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF

Rwanda, Burundi, Malawi



EASTERN AFRICA POWER POOL Urgent interconnection projects by 2025

Identified to be implemented during the period of the 2016–26 Strategic Plan

Interconnection between	Distance	Type	Capacity
Sudan – Ethiopia	550km	AC, 500kV	1,600MW
Egypt – Sudan	775km	AC, 500kV	500MW
Rwanda – Tanzania	115km	AC, 220kV	200MW
Uganda – South Sudan	200km	AC, 400kV	600MW
Libya – Egypt	163km	AC, 220kV	200MW
Kenya – Uganda	254km	AC, 400/200kV	300MW

Source: EAPP Strategic Plan 2016–26



Capacity (MW)	Rwanda	Burundi	Malawi
Operating	201	80	480
Construction	155	43	124
Planned*	72	78	102

Source: African Energy Live Data, April 2020. www.africa-energy.com/database

* Projects with a planned commercial operation date of 2025 or earlier.

Access to electricity*	Rwanda	Burundi	Malawi
Population	11.81	10.87	19.17
Those with access	4.02	0.98	2.49
% with access	34	9	13

* 2017, millions. Sources: SEforALL; IMF



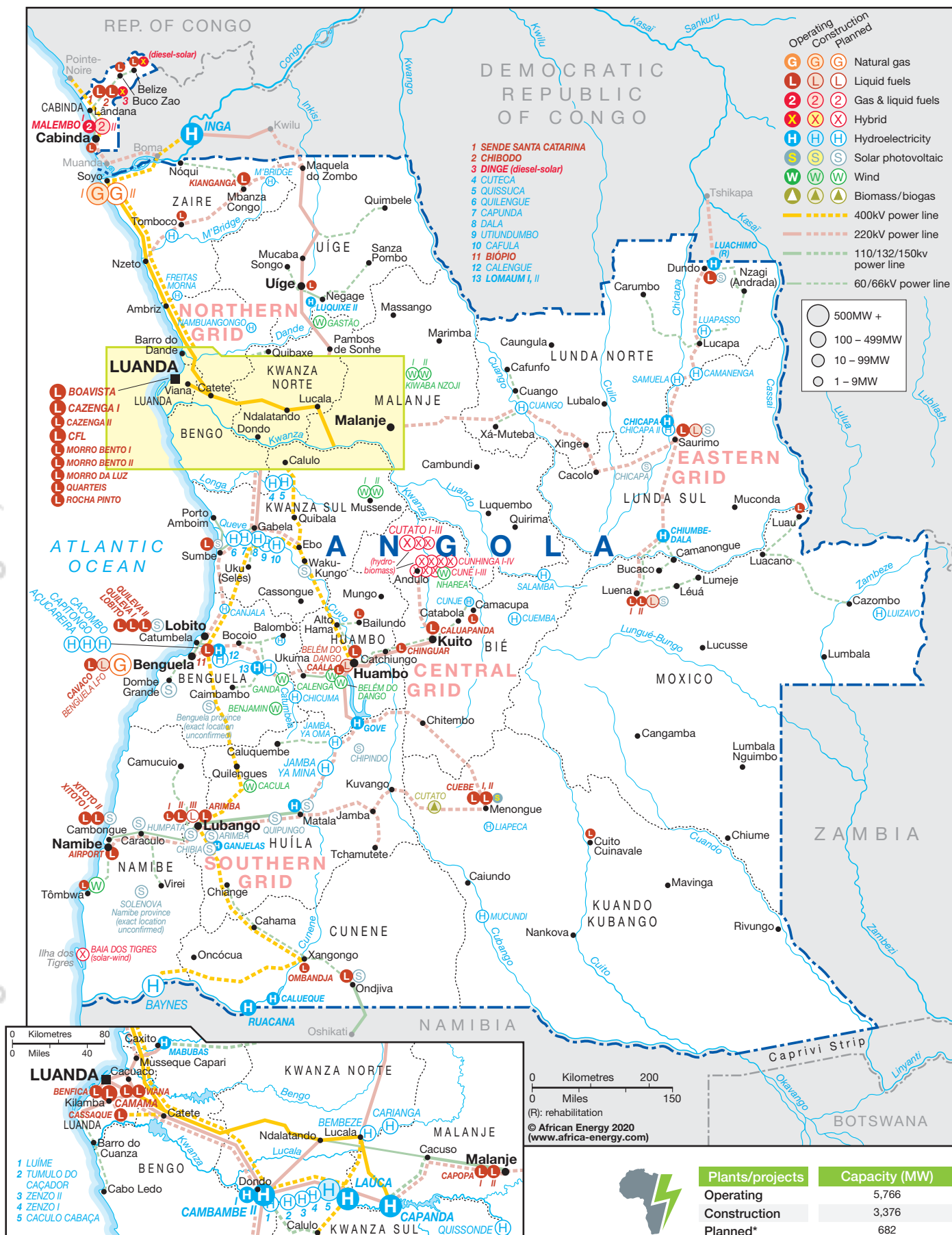
Plants/projects	Capacity (MW)
Operating	1,765
Construction	2,383
Planned*	1,780

Access to electricity (2017, millions)	
Population	50.05
Those with access	16.52
% with access	33

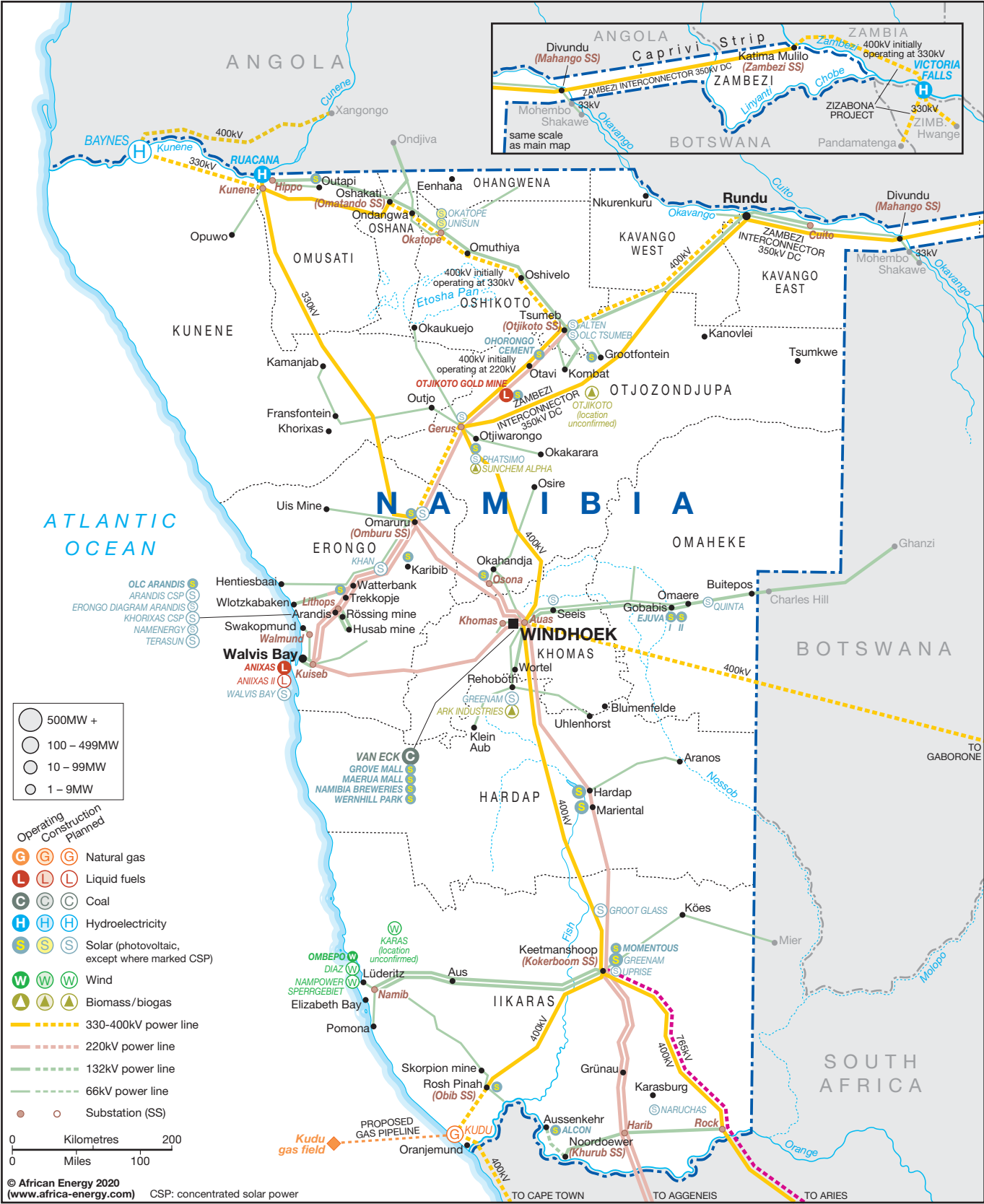
Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF

Angola



Plants/projects	Capacity (MW)
Operating	5,766
Construction	3,376
Planned*	682



Access to electricity*	Angola
Population	28.38
Those with access	11.92
% with access	42

* 2017, millions. Sources: SEforALL; IMF



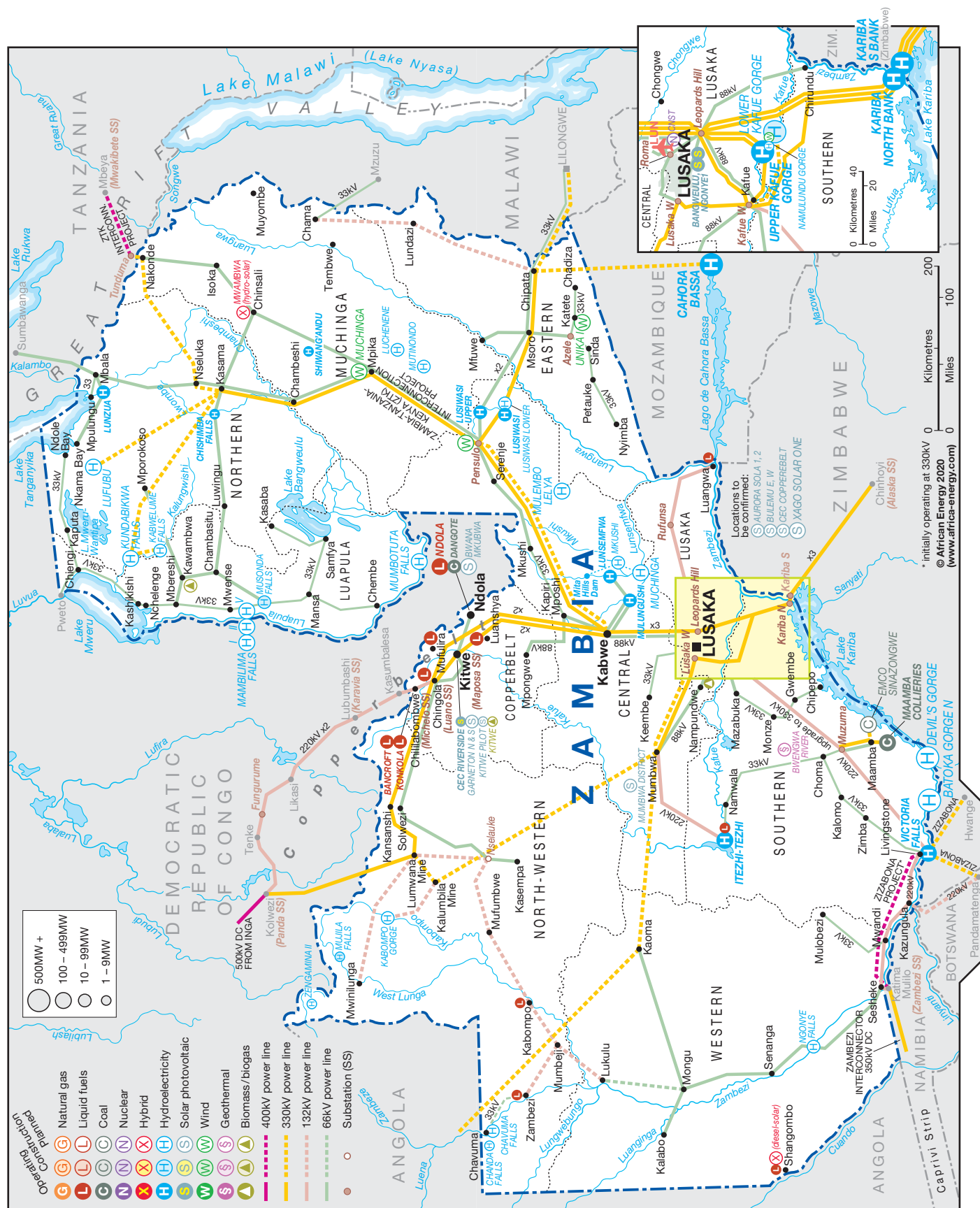
Plants/projects	Capacity (MW)
Operating	675
Construction	10
Planned*	220

Source: African Energy Live Data, April 2020.
* Projects with a planned commercial operation date of 2025 or earlier.

Access to electricity* (2017, millions)	
Population	2.37
Those with access	1.26
% with access	53

* Namibia
Sources: SEforALL; IMF

Zambia



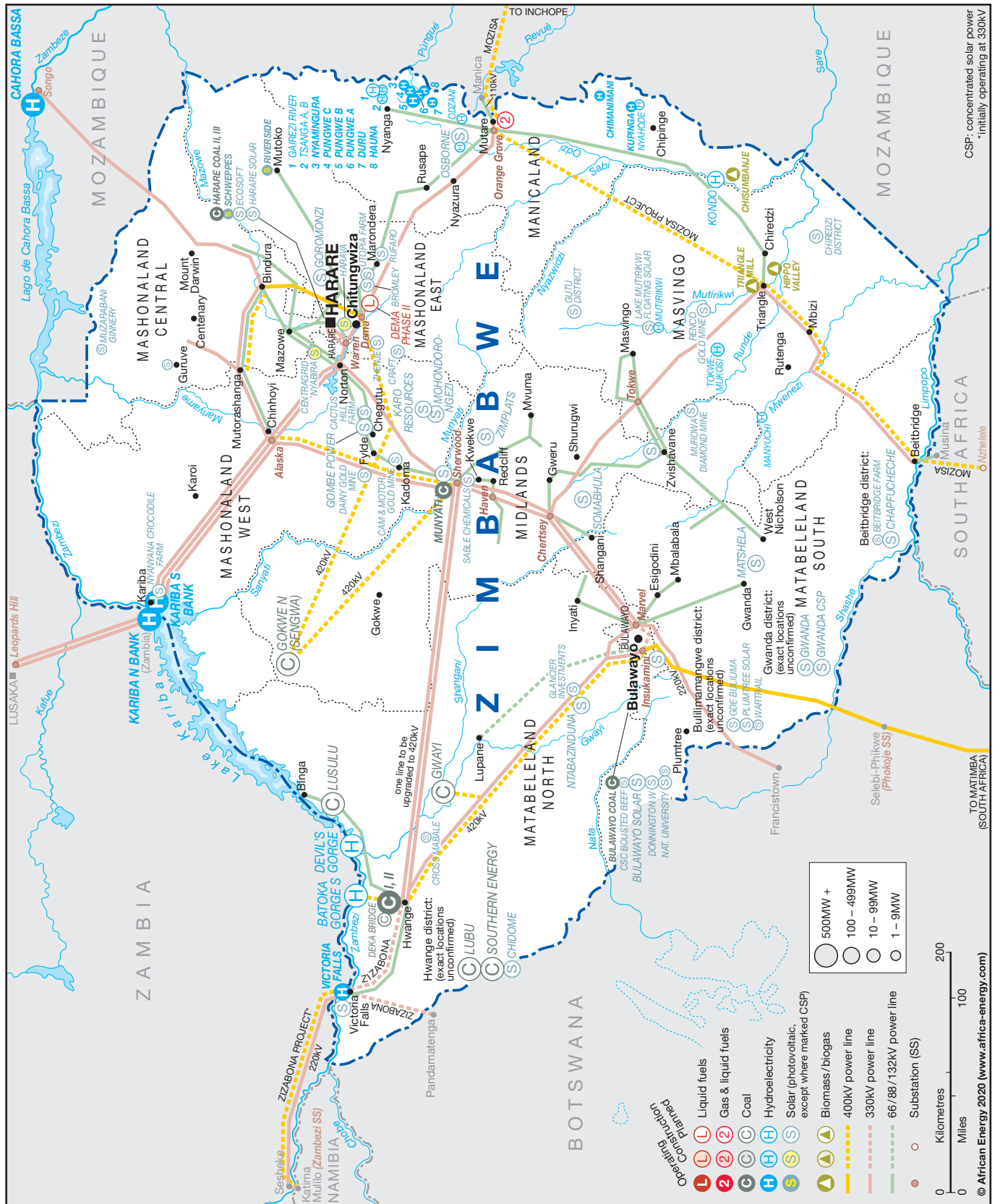
Plants/projects	Capacity (MW)
Operating	3,030
Construction	751
Planned*	2,421

Access to electricity (2017, millions)

Population	17.24
Those with access	6.90
% with access	40

Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF



Plants/projects	Capacity (MW)
Operating	2,392
Construction	643
Planned*	1,472

Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Access to electricity (2017, millions)	
Population	14.88
Those with access	5.95
% with access	40

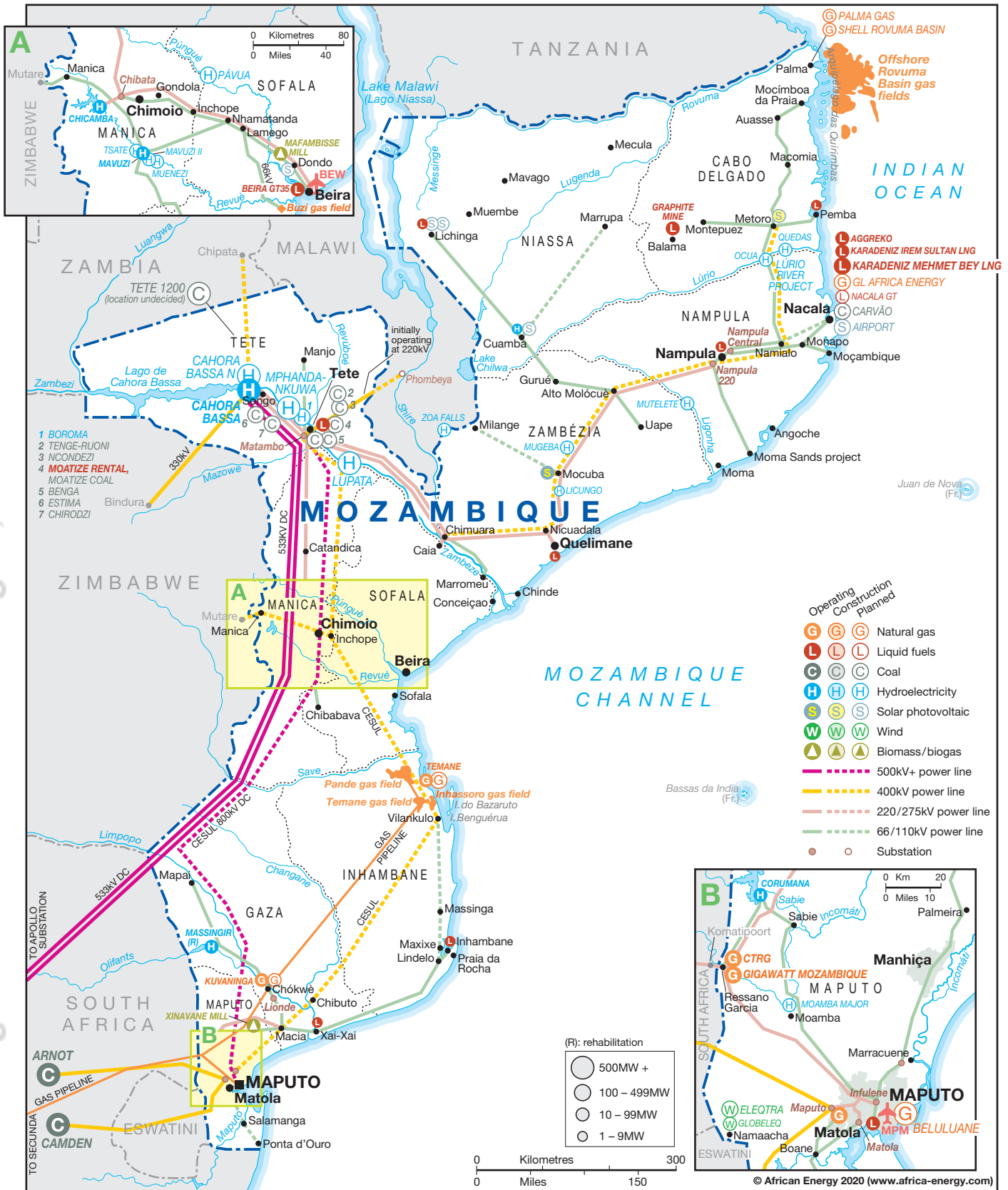
Sources: SEforALL; IMF

Botswana



Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Sources: SEforALL; IMF



Plants/projects	Capacity (MW)
Operating	2,941
Construction	41
Planned*	778

Source: African Energy Live Data, April 2020. Search for a power plant or project at www.africa-energy.com/database
 * Projects with a planned commercial operation date of 2025 or earlier.





Capacity (MW)	South Africa
Operating	58,309
Construction	6,608
Planned*	1,367

Source: African Energy Live Data, April 2020. www.africa-energy.com/database
* Projects with a planned commercial operation date of 2025 or earlier.

Access to electricity (2017, millions)	
Population	56.52
Those with access	47.48
% with access	84

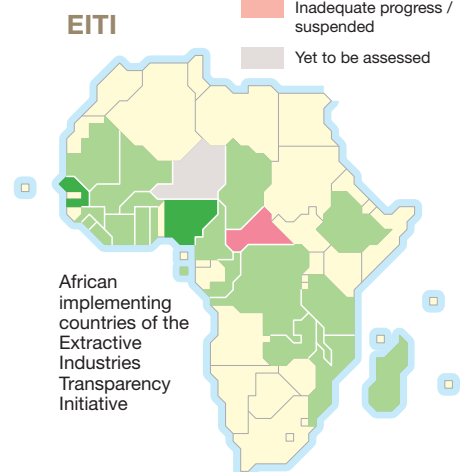
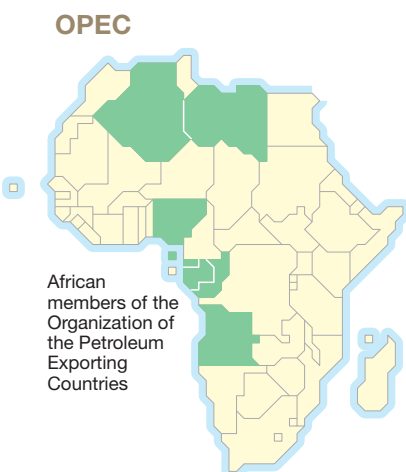
Sources: SEforALL; IMF

Document assigned to Valentina Calcagno, Fondazione Eni Enrico Mattei.



* 2017, millions. Sources: SEforALL; IMF

NATIONAL OIL AND GAS COMPANIES AND STATE REGULATORS



North African politics trump resources in an unstable region

The resurgence of Egypt as a gas exporter and progress towards the development of domestic gas discoveries in Morocco are bright spots in an otherwise dismal hydrocarbons landscape. Elsewhere, politics and conflict have conspired to undermine promising prospects and there is little sign of this changing soon

In Egypt, where the offshore Nile Delta has become one of Africa's most prospective hydrocarbons zones, the vast Zohr discovery and the development of various other prospects has inspired the government to establish a hub for eastern Mediterranean gas. There are significant commercial and logistical as well as geopolitical barriers to this plan, but an open policy towards IOC investment has driven interest in the sector.

Eni and BP are responsible for most recent additions to production capacity. Eni's near-field exploration strategy has added production at Nooros in the Nile Delta, Abu Rudeis Sidri in the Gulf of Suez, and Nour off North Sinai. BP has added production at Atoll and at fields in the West Nile Delta development, although start-up of the Raven field has been delayed until the end of 2020.

Companies signing up for offshore exploration in 2019 and early 2020 included ExxonMobil, which agreed two licences on a bilateral basis. As well as loosening the historical dominance of Eni and BP, these deals also marked an important change in approach. Neither of them was agreed as part of a licensing round, which is how almost all awards in Egypt have been made until now. Other blocks have been licensed by Russia's Zarubezhneft, Neptune Energy, Chevron, Royal Dutch Shell and the UAE's Mubadala Petroleum. At the same time, an active farm-in and acquisition market for Egyptian assets has led to multiple transactions, a trend that shows no sign of slowing.

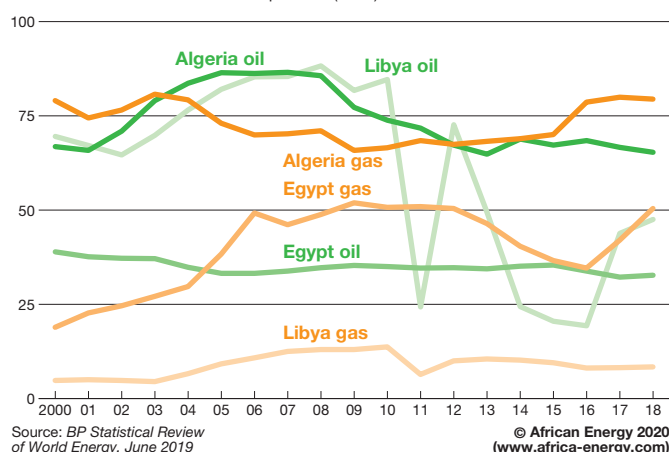
The planned development of gas discoveries by Sound Energy and SDX Energy have dominated Morocco's upstream sector, providing a more optimistic perspective following the failure to discover significant hydrocarbons in the offshore Atlantic margin.

In February 2020, Sound switched to a fast-track early production project based around a micro-LNG scheme for industrial customers, with first gas planned for 2021. A longer-term full field development with a 120km pipeline will eventually see gas sold to state utility Office National de l'Electricité et de l'Eau Potable for power generation.

Challenging climate

By contrast, Algeria and Libya, the former giants of North African oil and gas, continue to present unenticing prospects for upstream investors. Algeria's attempts to overcome a decade of political dysfunction and botched management have repeatedly foundered on its inability to maintain stable leadership at national oil and gas company Sonatrach. In 2018,

MAJOR NORTH AFRICAN OIL AND GAS PRODUCERS, 2000–18
Million tonnes / million tonnes oil equivalent (mtoe)



its then head Abdelmoumen Ould Kaddour instituted a new commercial approach, reset relationships with IOCs and pushed for major revisions to the hydrocarbons code, which were finally promulgated on the day before the December 2019 presidential election.

Any concrete benefits from these developments have been dissipated in the political maelstrom that followed the end of Abdelaziz Bouteflika's presidency in April 2019. Immediately after Bouteflika withdrew his candidacy and the planned presidential election was postponed, Kaddour was dismissed. Three others have headed the parastatal since then. While ExxonMobil signed an agreement in September 2019 to participate alongside Eni, Equinor and Total in a study assessing the hydrocarbon potential of the Algerian Sahara, IOCs are still holding back from commitments to exploration or development.

In Libya, warlord Khalifa Haftar's blockade of oil production and export facilities in January 2020 reduced output from 1.2m b/d to a little over 114,000 b/d by early March. By this time, it had caused about \$3bn in cumulative losses. Among Haftar's demands for lifting the blockade were the replacement of the heads of the Central Bank and National Oil Corporation, plus a greater share of oil revenues to be distributed to the eastern province of Cyrenaica.

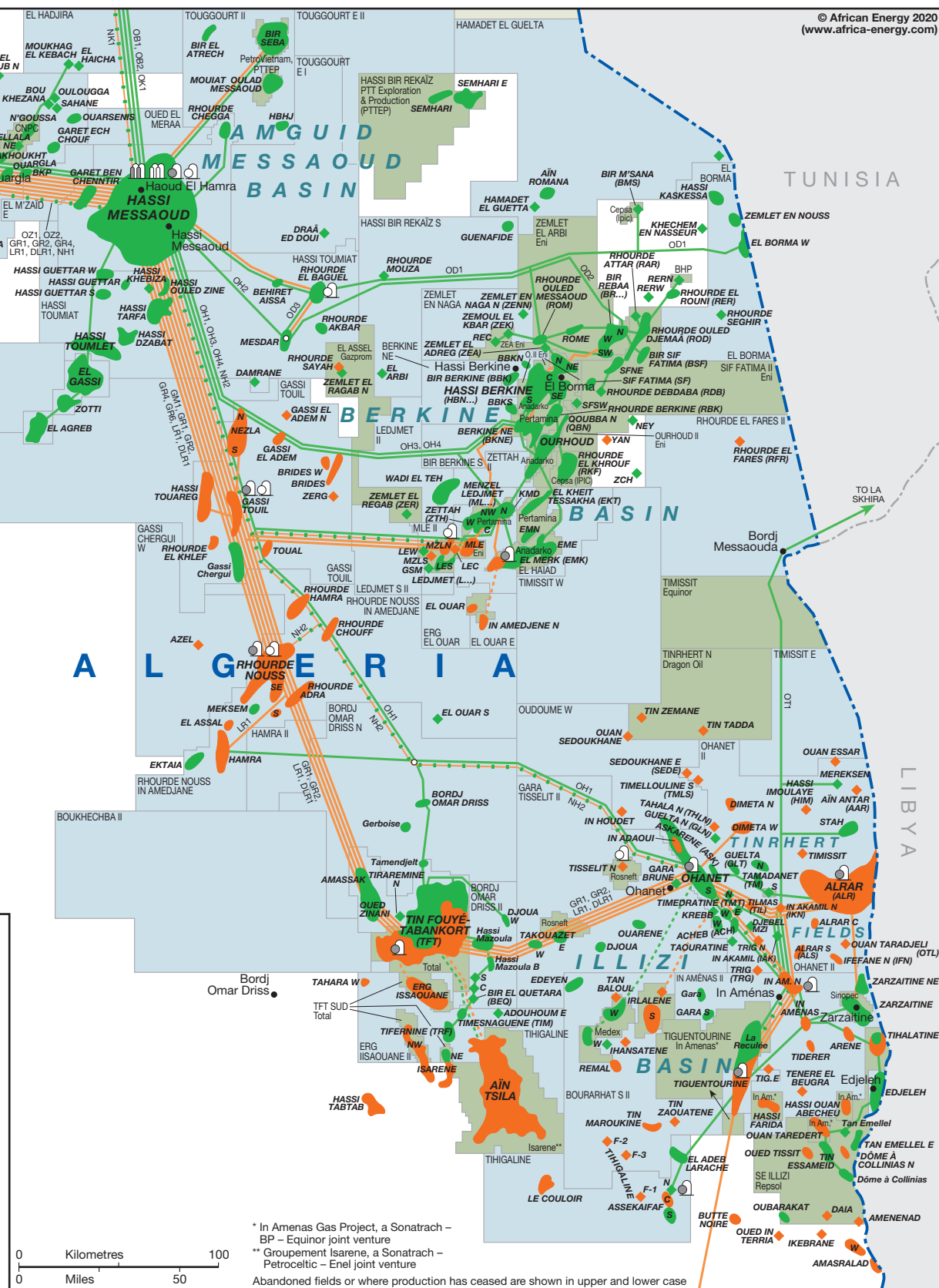
Neither Haftar nor the Tripoli-based Government of National Accord has sufficient military or geopolitical leverage to finish the other off, and the only certain outcome is that NOC's ambitious development plans have once again been indefinitely delayed.



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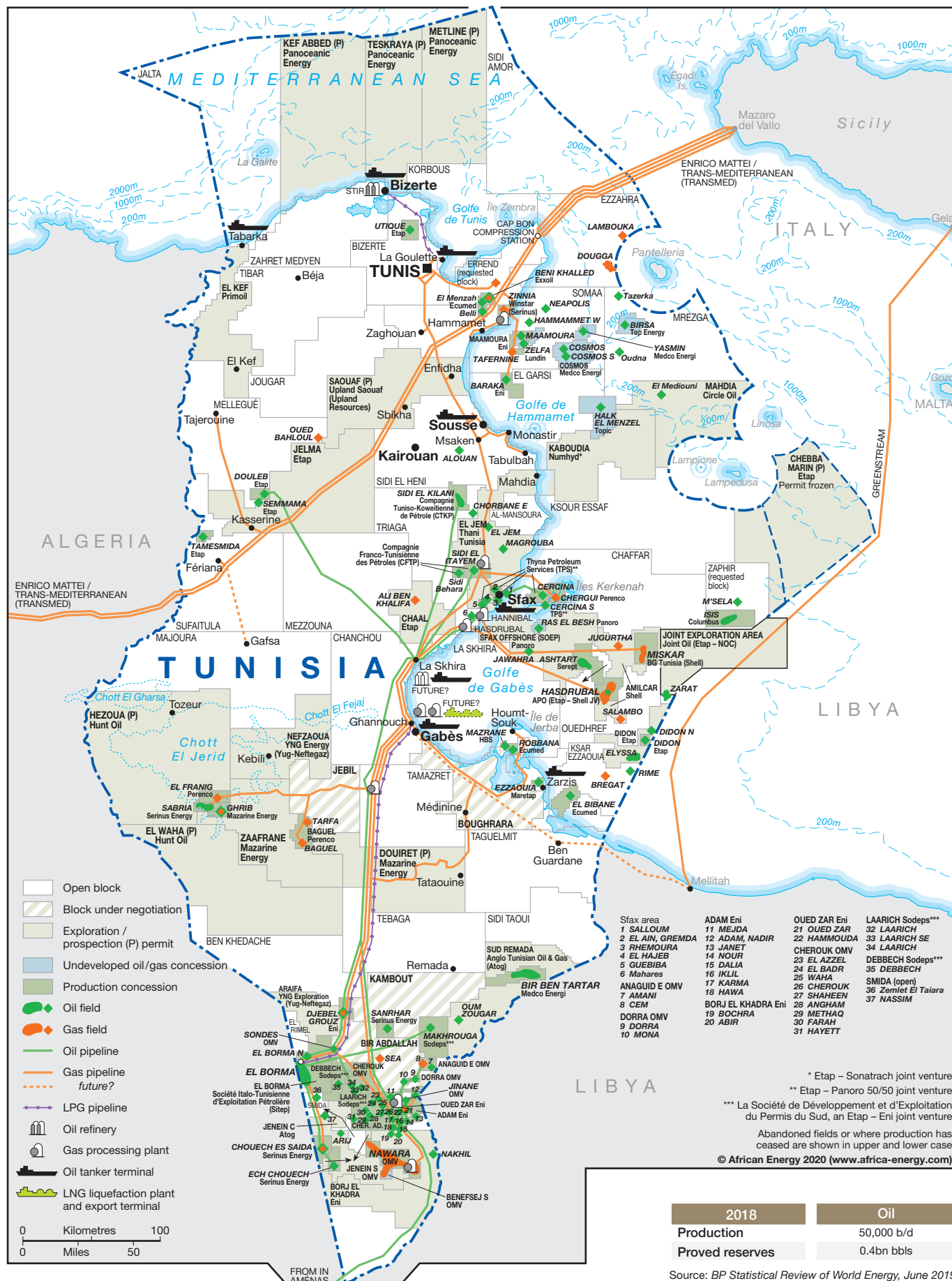


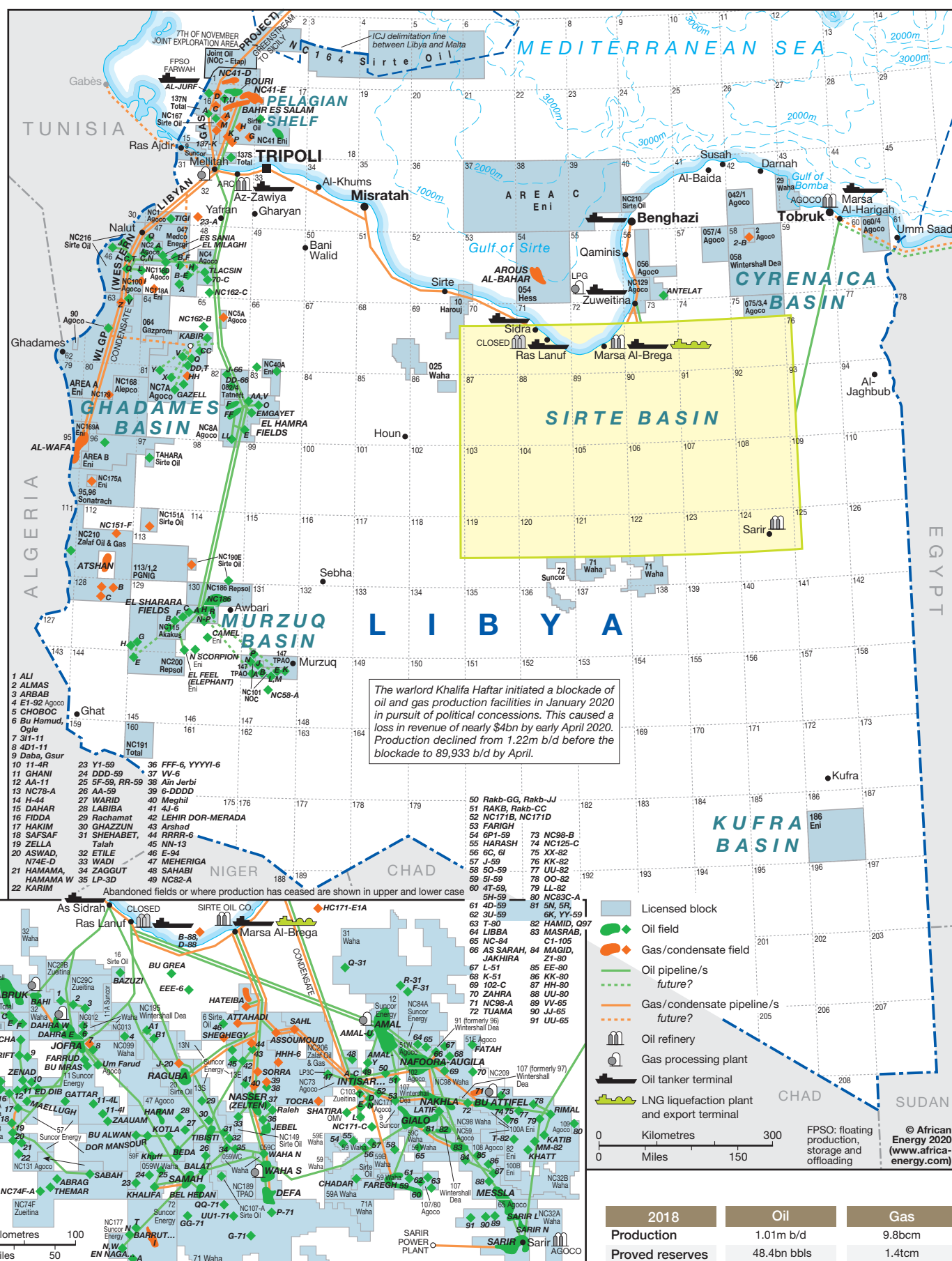


	2018	Oil	Gas
Production		1.51m b/d	92.3bcm
Consumption		414,000 b/d	42.7bcm
Proved reserves		12.2bn bbls	4.3tcm

Source: BP Statistical Review of World Energy, June 2019

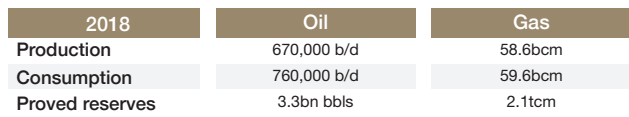
Tunisia



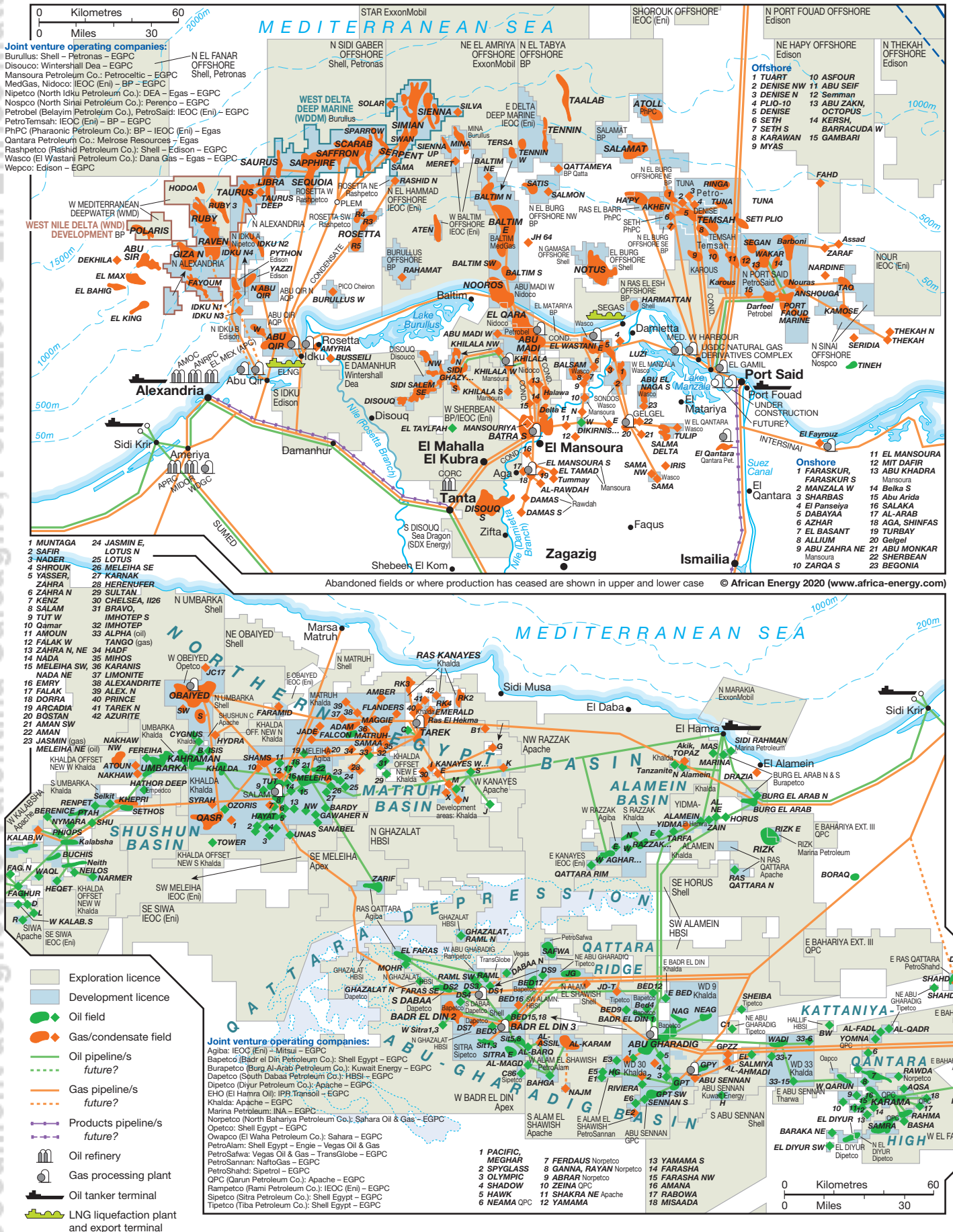


2018	Oil	Gas
Production	1.01m b/d	9.8bcm
Proved reserves	48.4bn bbls	1.4tcm

Source: BP Statistical Review of World Energy, June 2019



Nile Delta, Western Desert





African states compete for investment as IOCs look to low-carbon future

Upstream oil companies are reviewing opportunities in a rapidly changing industry, where a low oil price and the need to meet carbon targets mean some projects could be pushed back or suspended altogether

The energy transition poses challenges for sub-Saharan Africa's upstream exploration sector as IOCs seek out lower-cost, lower-carbon opportunities. Before the latest price crash, some governments had started to realise the importance of offering competitive commercial terms to attract investment, as the promise of new megafinds offshore South America lured companies away from Africa to pursue similar geology on the other side of the Atlantic. Now, changing market dynamics mean some of Africa's oil reserves may remain in the ground as companies walk away from uneconomic discoveries.

Many companies' finances are in much better shape thanks to actions taken following the last price collapse, but some will struggle to absorb any sustained oil price weakness through the balance sheet.

East Africa's grand ambitions for a pipeline network pumping crude to the coast from fields in Uganda, Kenya and South Sudan look increasingly remote. While Total has reached a deal to buy Tullow Oil's Uganda assets, the two companies have both put their Kenya assets up for sale, raising the question of who can be persuaded to develop them if not these two Africa specialists. Chinese and Indian companies active in South Sudan have shown little appetite for expansion. CNOOC is a partner in Uganda's stalled project, where disagreement over tax terms has held up development of the Lake Albert oil fields and an export pipeline to Tanzania, but the Chinese company already pulled out of Kenya after finding non-commercial gas in Block 9.

Long an African exploration trailblazer, Tullow has been obliged to sharply scale back its activities, hampered by lower-than-expected Ghana production, delays in East Africa and a significant debt overhang.

Mozambique focus

Following its purchase of Anadarko's African assets, Total is now focused on leading the development of the Mozambique LNG scheme, which is moving ahead despite concerns about the threat from an Islamist insurgency in the northern Cabo Delgado province.

The Total-led project, which reached a final investment decision (FID) in June 2019, will develop gas from the Golfinho and Atum fields in Area 1 to supply an initial two-train, 12.9m t/yr liquefaction plant to be built by a consortium of Saipem, McDermott International and Chiyoda Corporation. Area 1 contains more than 60tcf of gas resources, of which 18tcf will

be developed with the first two trains. Almost 90% of the production is already sold through long-term contracts with LNG buyers in Asia and Europe, and the project also has a domestic supply component.

The first gas from the Rovuma Basin will be produced by Eni from the 3.4m t/yr Coral South floating LNG scheme, which is due to start up in 2022. This will be followed by development of a second onshore plant at the Afungi site in northern Mozambique, processing gas from the Mamba fields. JGC, TechnipFMC and Fluor have been awarded a contract to build the 15.2m t/yr plant, but FID, which had been expected in 2020, has been pushed back for the onshore project to be led by ExxonMobil.

Offshore gas development is less advanced in Tanzania, where the government and IOCs have yet to negotiate a host government agreement for their planned LNG scheme. The situation has been further complicated by a review of production-sharing agreement terms launched in 2019. President John Magufuli is keen to maximise government revenues and the use of gas for domestic offtake, while IOCs are seeking the terms they need to make Tanzanian LNG more competitive with rival supply from Mozambique and further afield and to put the project's finances on a stable footing.

Reform moves

Eager to modernise and diversify the economy after years of drift in the latter stages of the dos Santos presidency, Angola aims to offer more than 50 blocks for licensing by the end of 2025. New laws passed in 2018 created a framework for monetising gas and for developing smaller fields. And while an initial licensing round in 2019 attracted only limited interest, the new sector regulator, the Agência Nacional de Petróleo, Gás e Biocombustíveis, has indicated it is open to industry feedback. Angola's economy will be particularly hard hit by the combination of a lower oil price and a drop in demand from its main Chinese export market.

Nigeria, Africa's biggest oil producer, is less dependent on exports to China, though it will be affected by the lower oil price. The International Monetary Fund cut its 2020 gross domestic product growth forecast from 2.5% to 2% because of a fall in oil prices triggered by the coronavirus pandemic.

While opportunities exist for smaller companies to pick up assets being sold off by the majors, Nigeria is still promising long-awaited sector reforms. Changes to the offshore oil royalty

Sub-Saharan Africa

system passed in October 2019 overhauled legislation dating back to the early 1990s, when the military government of the time offered attractive tax terms in an effort to open up new deep-water production. Finally bringing in regulatory certainty after two decades of wrangling over the Petroleum Industry Bill is becoming more and more urgent as existing upstream block leases start to expire from 2023.

Newcomer Senegal is hoping to attract new players in its 2020 licensing round as the Sangomar oil development and the Greater Tortue Ahmeyim LNG scheme on the border with Mauritania get under way. Operator Woodside Energy is targeting first oil in early 2023 from Sangomar, which reached FID in January 2020. Japan's Modec is supplying a FPSO with an oil processing capacity of 100,000 b/d.

BP has agreed to buy all the LNG produced from the first phase of its Greater Tortue development with Kosmos Energy, which is aiming for first gas in H1 2022. The partnership is evaluating potential expansion up to 10m t/yr in subsequent phases and could develop two additional production hubs at Yakaar-Teranga in Senegal and in the Bir Allah/Orcia area in southern Mauritania.

Senegal's government passed a revised petroleum law in 2019 updating the terms of the 1998 law, which was drawn up at a time of very low world oil prices when Senegal had yet to find hydrocarbons, and the authorities are hoping to put aside the continued controversy over the role of businessman Frank Timis and presidential brother Aliou Sall in Senegal's oil and gas industry.

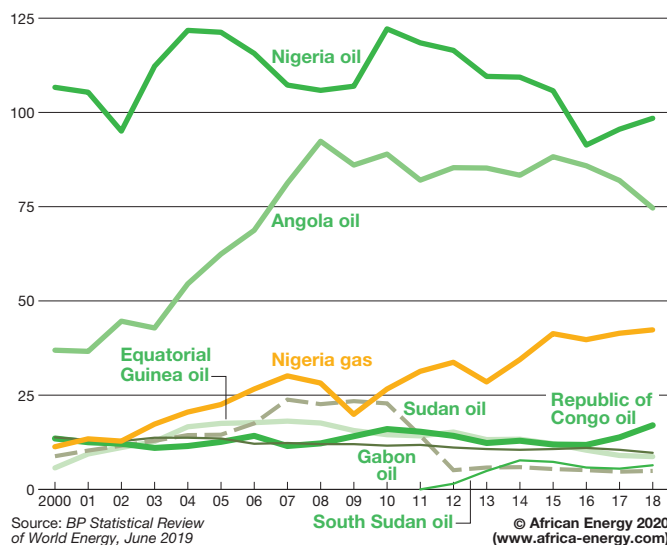
Further south, Kosmos has taken two deep-water blocks offshore Republic of Congo as part of a longer-term exploration strategy off the West African coast, which also encompasses Côte d'Ivoire and São Tomé and Príncipe.

Equatorial Guinea has ambitions to replace dwindling oil output with a new role as a regional gas aggregator. The government is partnering with Vitol for the Gas Megahub project, which aims to gather gas from Equatorial Guinea, Cameroon and potentially further afield to supply the EGLNG plant at Punta Europa and export LNG to countries in the West African region. The plant was built to supply the US, which now produces its own gas, and is seeking new markets, as well as new sources of supply as the Alba field declines.

Development of Noble Energy's Alen gas field to supply the EGLNG plant received project sanction in April 2019. The Fortuna field, which was awarded to Lukoil following the 2019 licensing round, is also now expected to supply the Punta Europa plant after Ophir Energy failed to secure financing for a floating LNG development.

Some of Cameroon's hitherto stranded gas could be handled through Punta Europa under Malabo's Megahub scheme, while gas from the Kribi fields is already being exported via a floating LNG project that started production in March 2018. Upstream operator Perenco has been considering a drilling

MAJOR SUB-SAHARAN AFRICA OIL AND GAS PRODUCERS, 2000–18 Million tonnes / million tonnes oil equivalent (mtoe)



campaign in the Kribi area to prove up more reserves during 2020. FLNG Hilli Episeyo is so far using only two of the vessel's four trains.

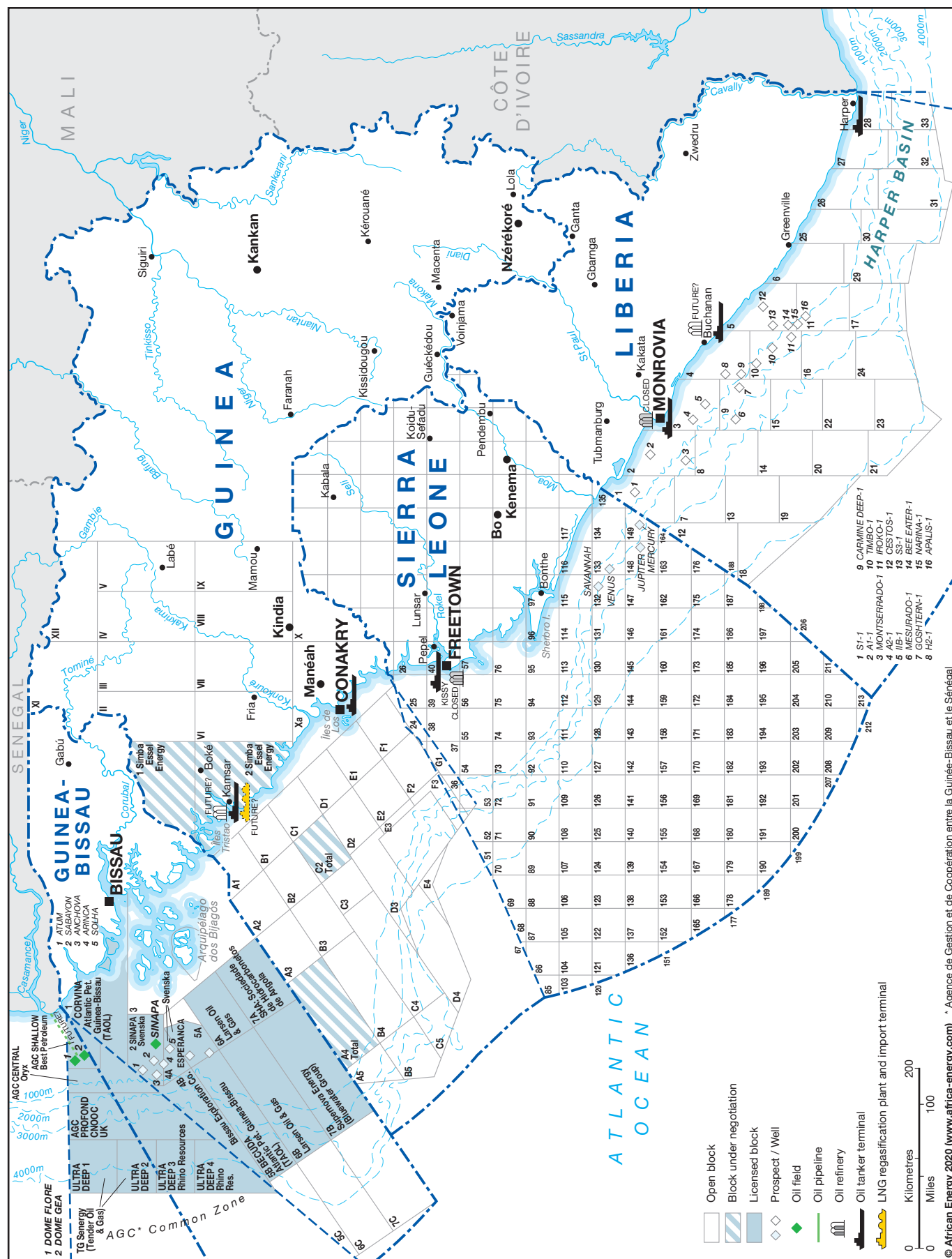
Southern Africa ambitions

Total has high hopes for South Africa after making the Brulpadda gas condensate discovery in early 2019. The company plans to drill up to three follow-up exploration wells in the deep-water Outeniqua Basin, but the development challenges are formidable. Brulpadda lies far out in the Southern Ocean, 175km offshore, in a water depth of 1,400 metres, in an area of strong currents and challenging sea conditions.

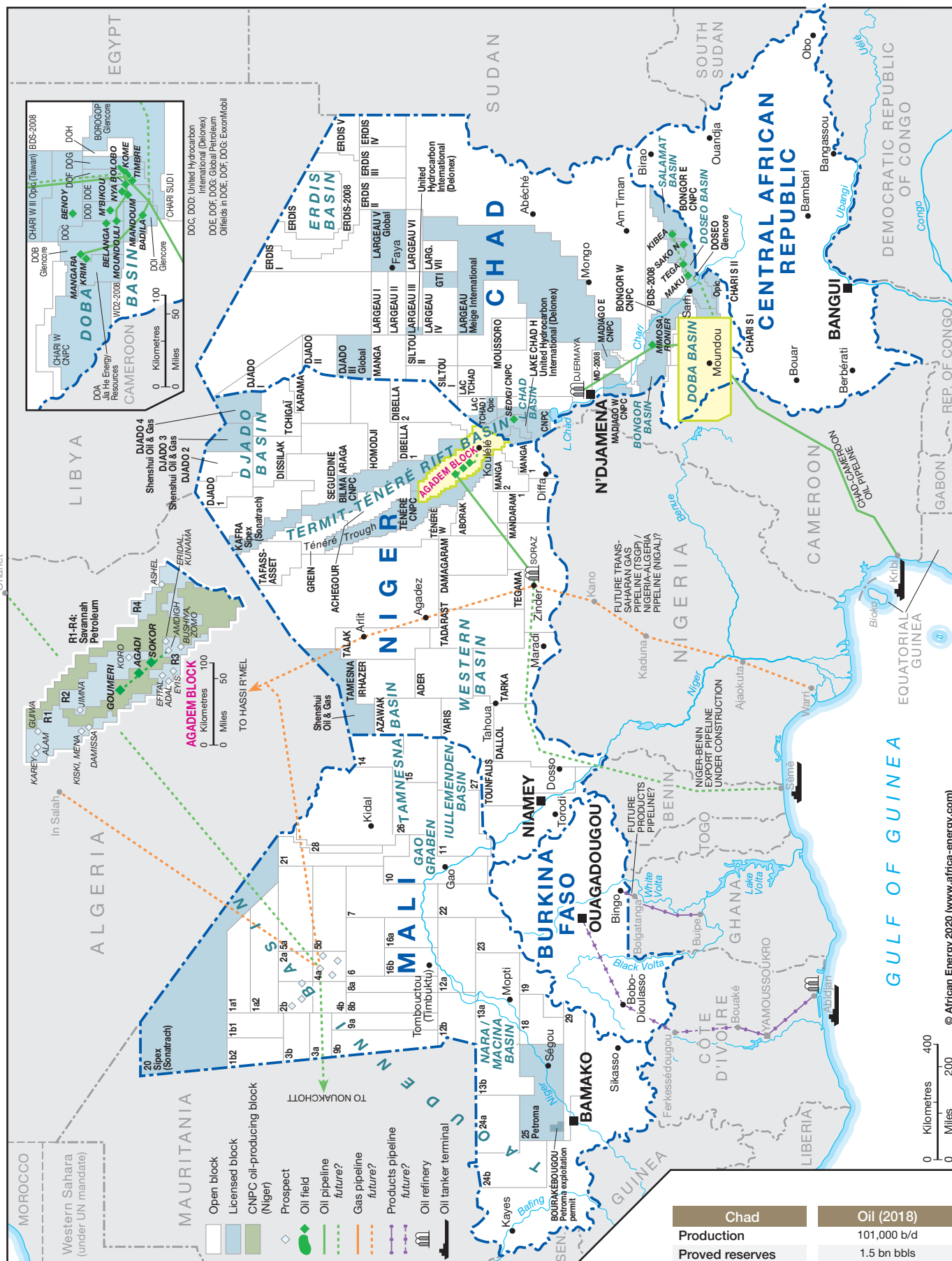
The South Africa government has moved to end long-running regulatory uncertainty in the upstream oil and gas sector with the publication in December 2019 of the draft Upstream Petroleum Resources Development Bill, which immediately attracted criticism for its generous provision of a 20% carried interest for the state in upstream projects, plus a minimum 10% black-owned interest. The previous legislation in the Mineral and Petroleum Resources Development Act Amendment Bill had been stuck in the approvals process for some years, but Total's Brulpadda discovery on Block 11B/12B has acted as a catalyst in encouraging the government to deliver the new legislation.

Namibia is also hoping for a revival of its exploration fortunes with high-impact wells planned by Total and Shell in the southern Orange Basin. Kosmos Energy is a partner with Shell in Namibia's PEL 39 and across the border with OK Energy in South Africa's Northern Cape Ultra-Deep Block, while up in the north, ExxonMobil has a significant position in the Namibe Basin straddling the border with Angola. Meanwhile, BW Offshore continues to discuss options for development of the Kudu gas field, which was discovered in 1974 by Chevron and has been through numerous operators since then.

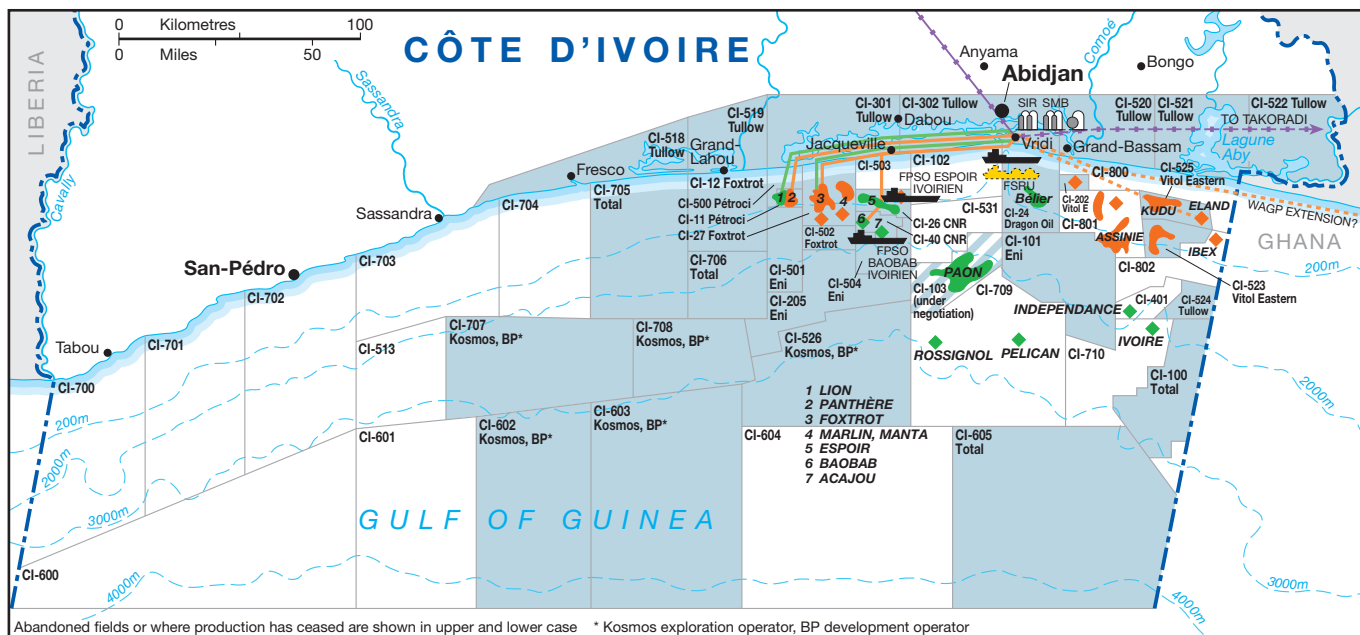




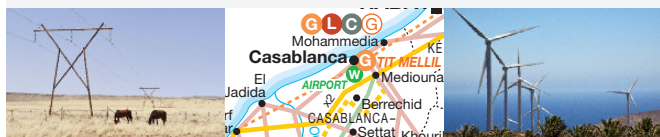
Mali, Burkina Faso, Niger, Chad, Central African Republic



Côte d'Ivoire



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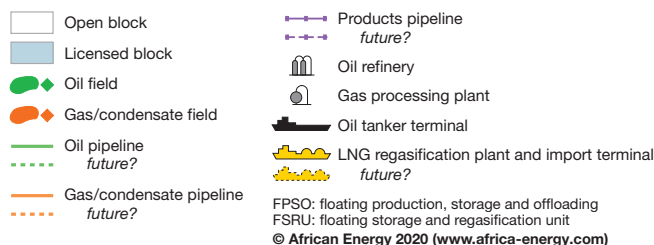
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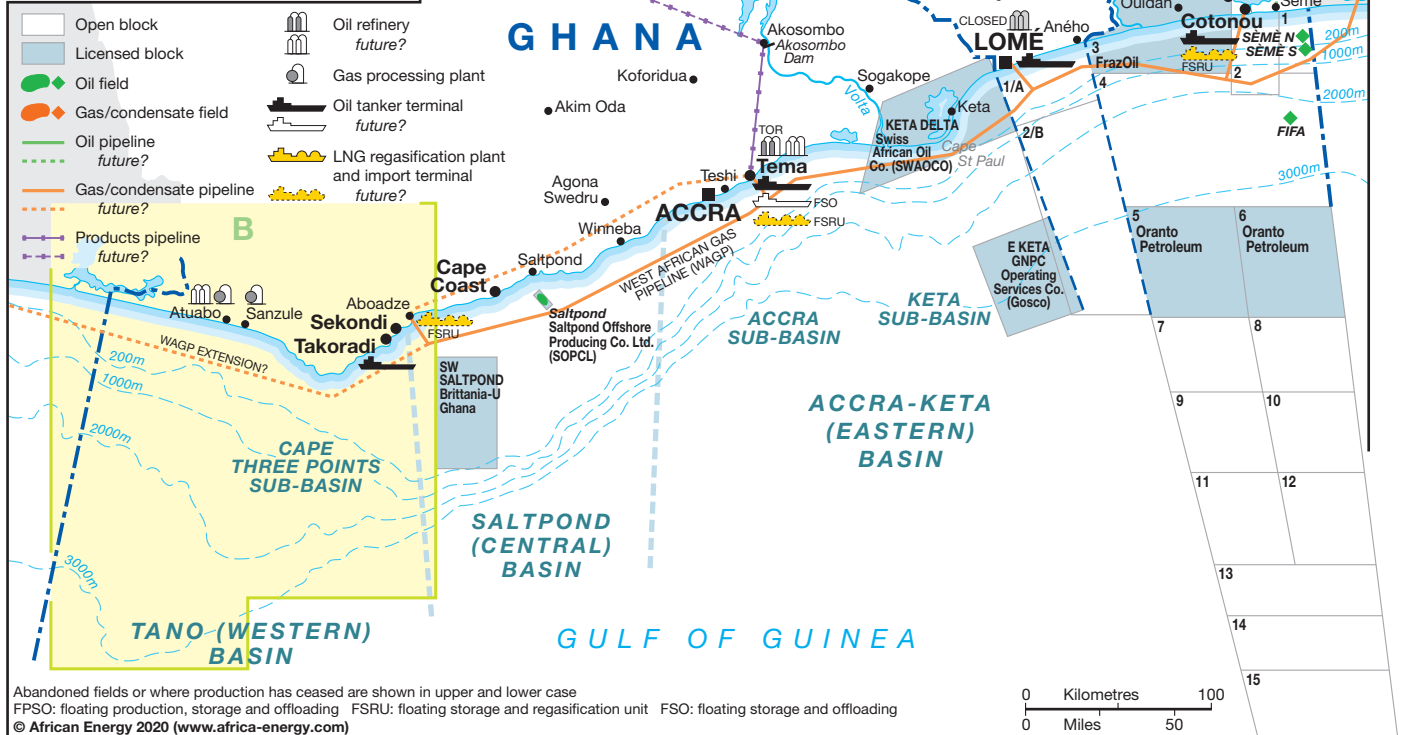
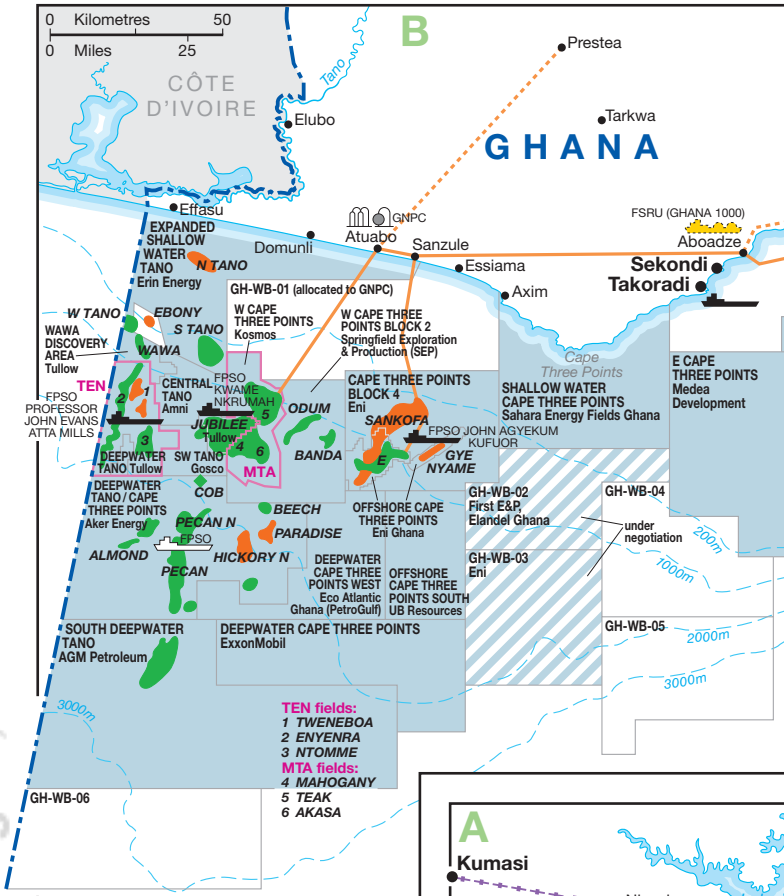
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Abandoned fields or where production has ceased are shown in upper and lower case
FPSO: floating production, storage and offloading FSRU: floating storage and regasification unit FSO: floating storage and offloading
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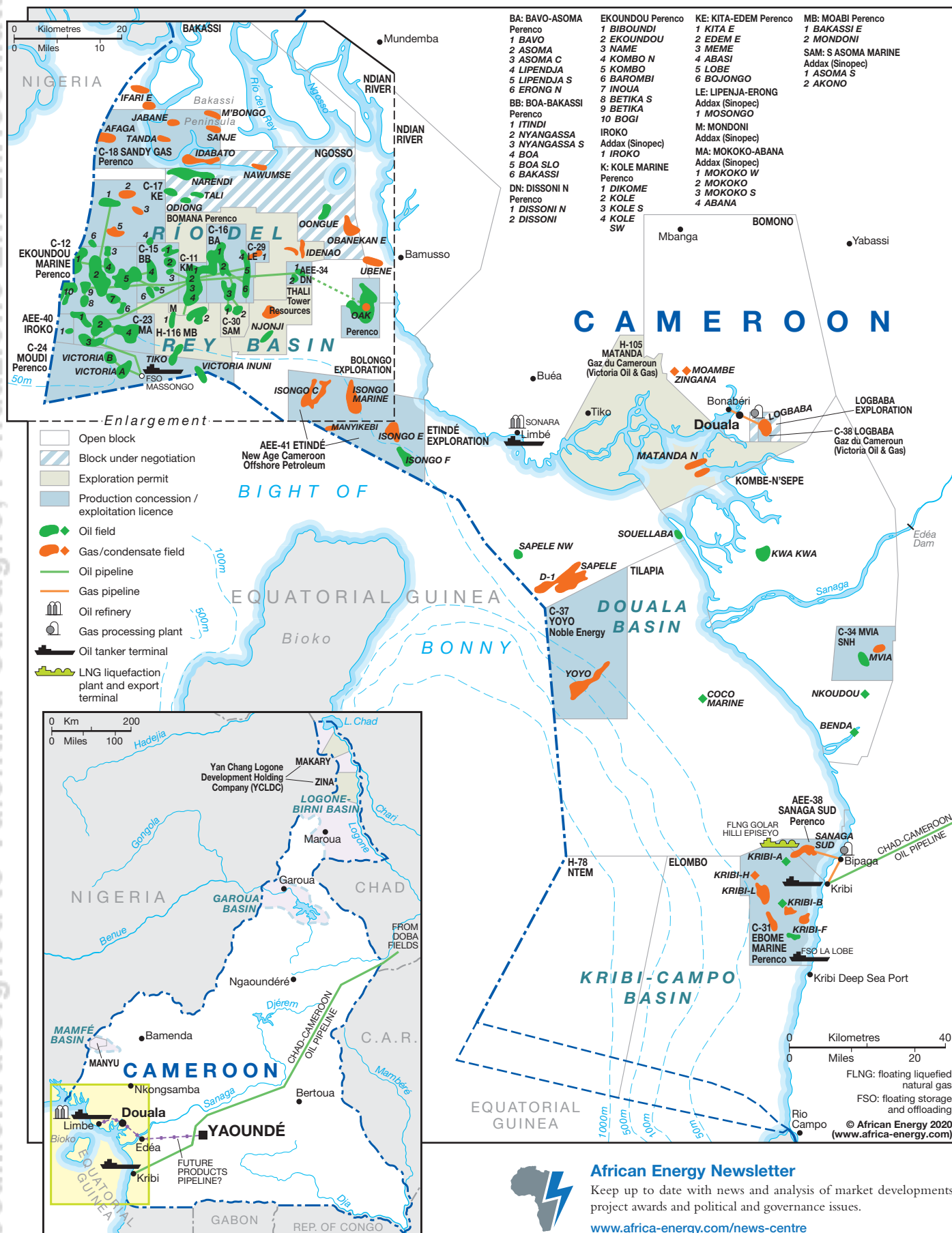


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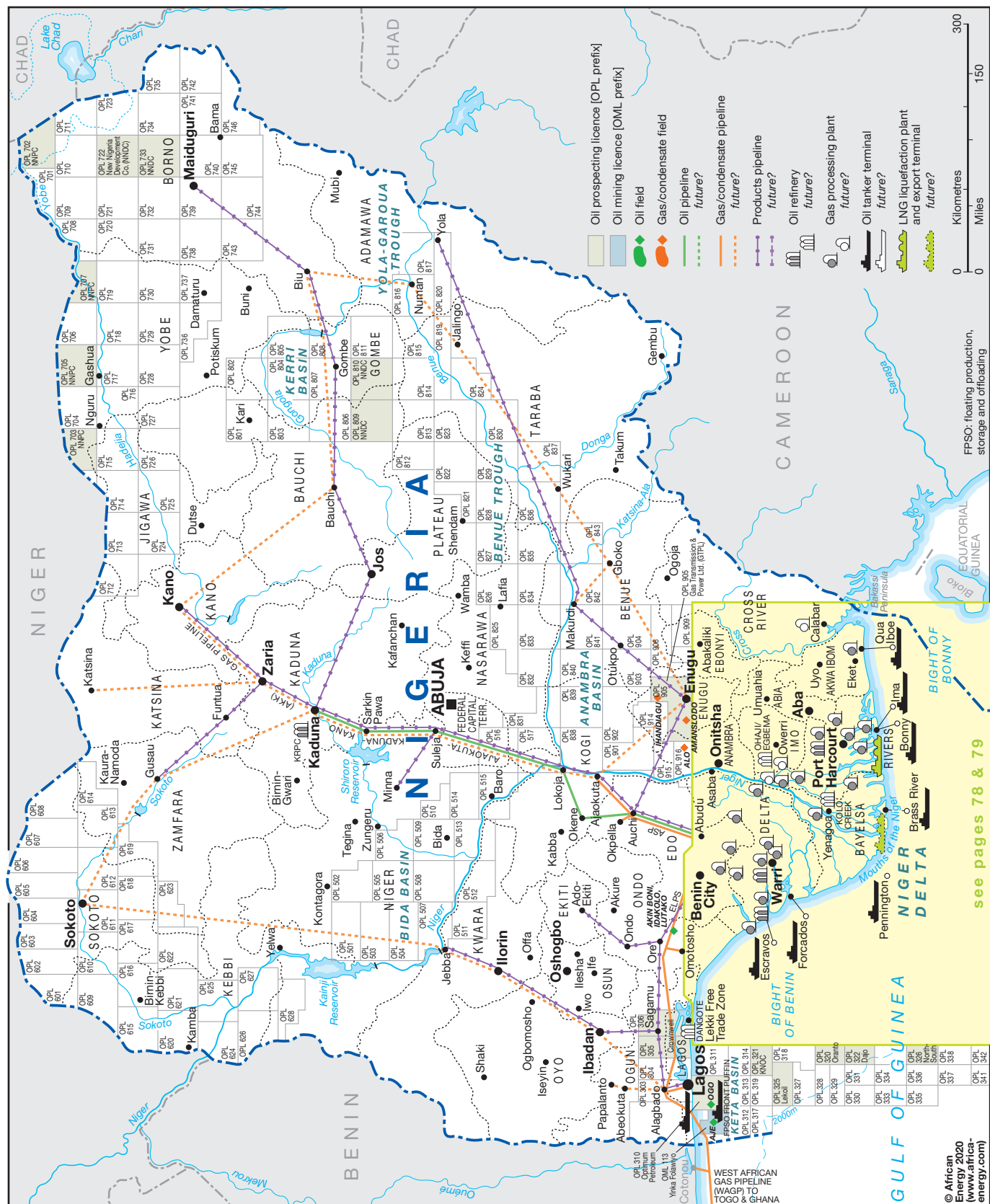
Cameroon



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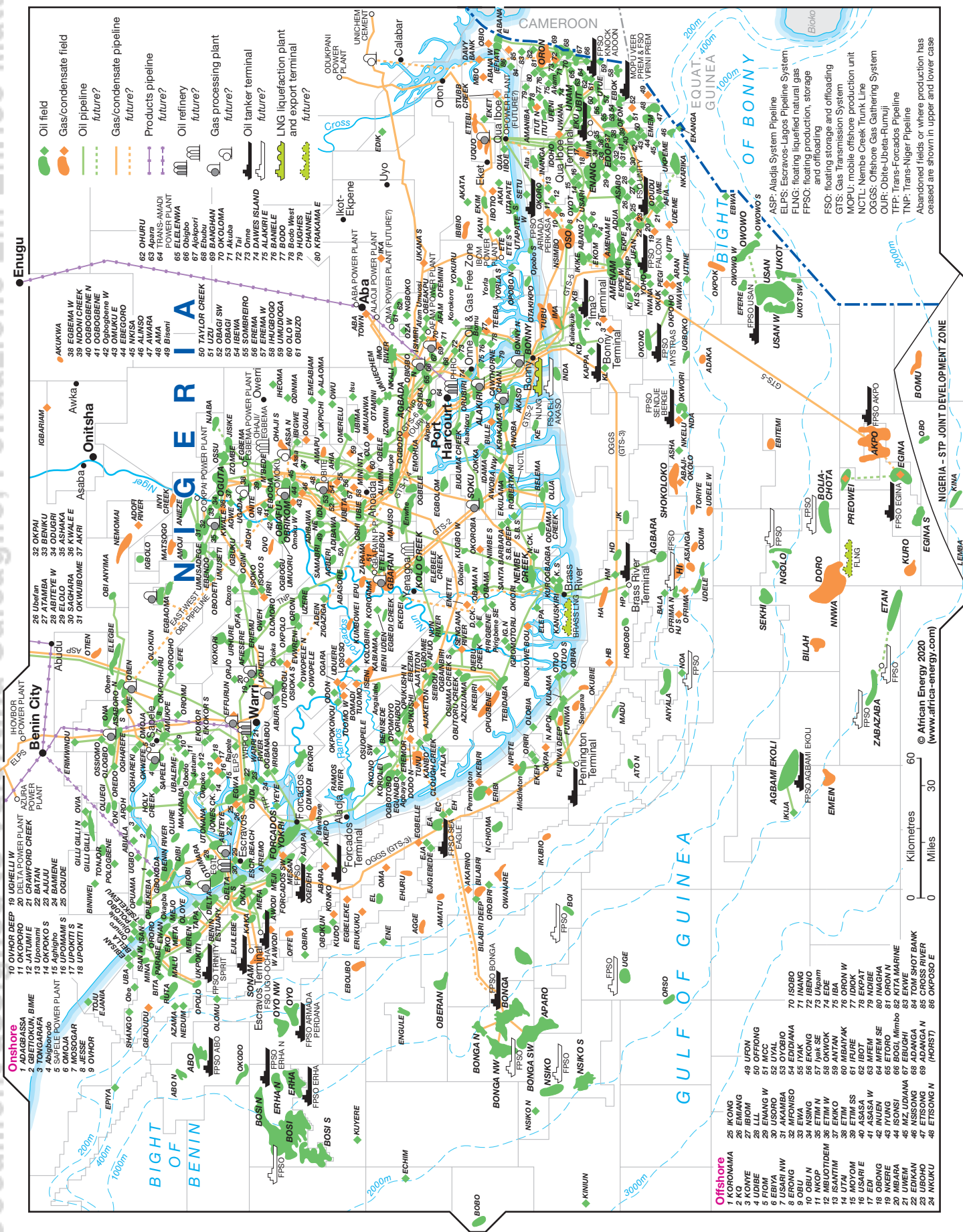
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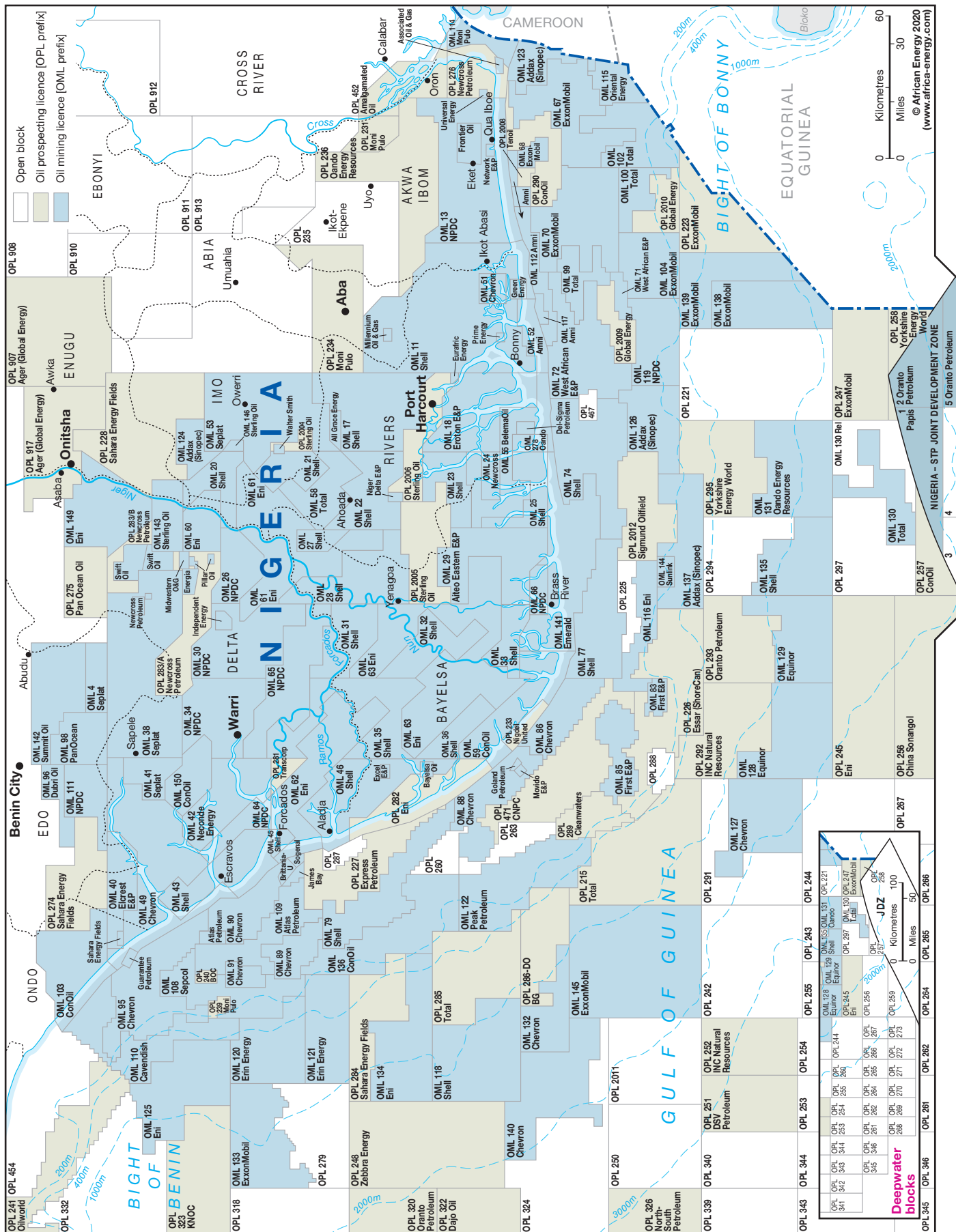


2018	Oil	Gas
Production	2.05m b/d	49.2bcm
Proved reserves	37.5bn bbls	5.3tcm

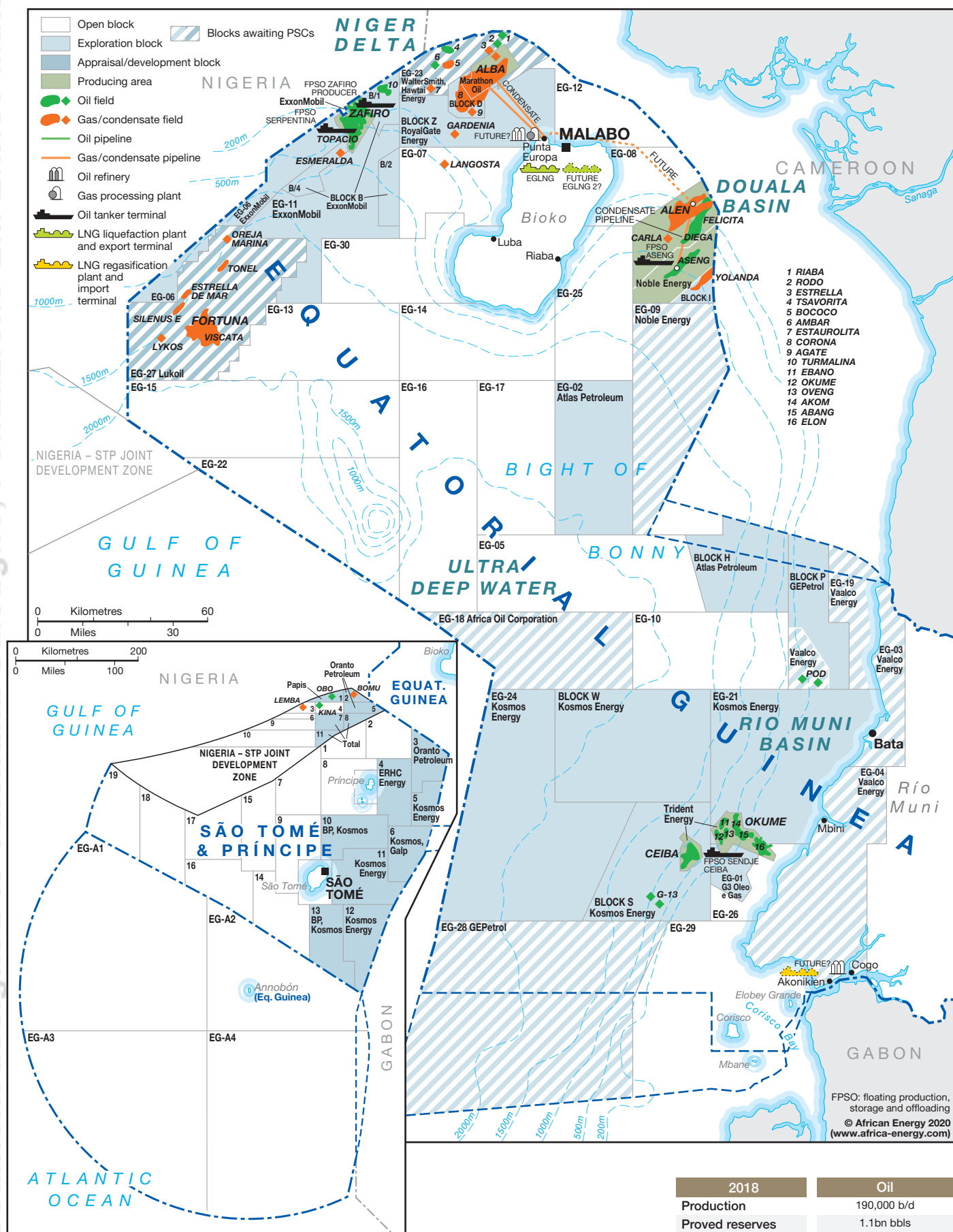
Source: BP Statistical Review of World Energy, June 2019

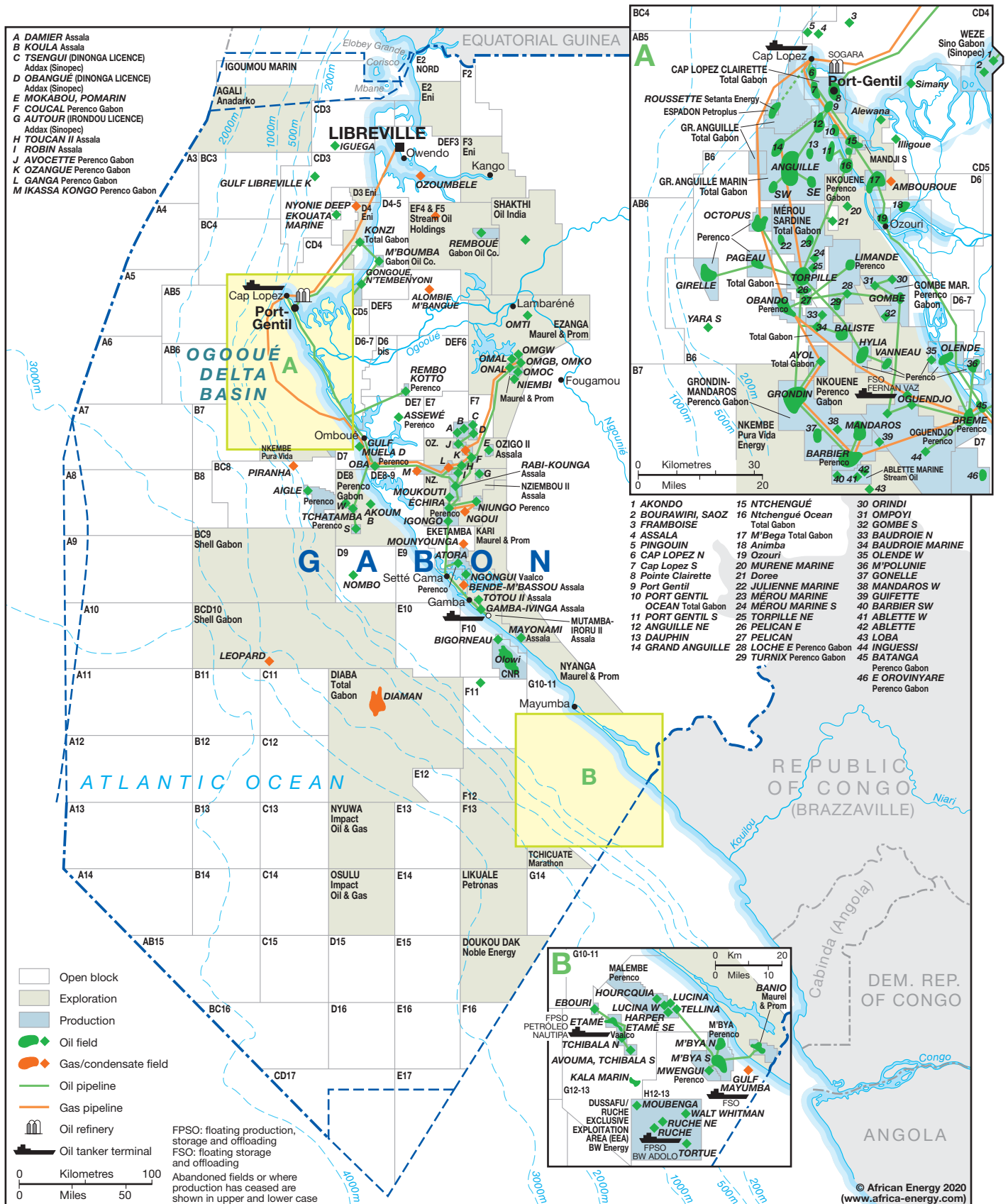
Niger Delta





Equatorial Guinea, São Tomé and Príncipe





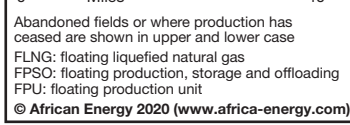
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2018	Oil
Production	194,000 b/d
Proved reserves	2bn bbls

Source: BP Statistical Review of World Energy, June 2019

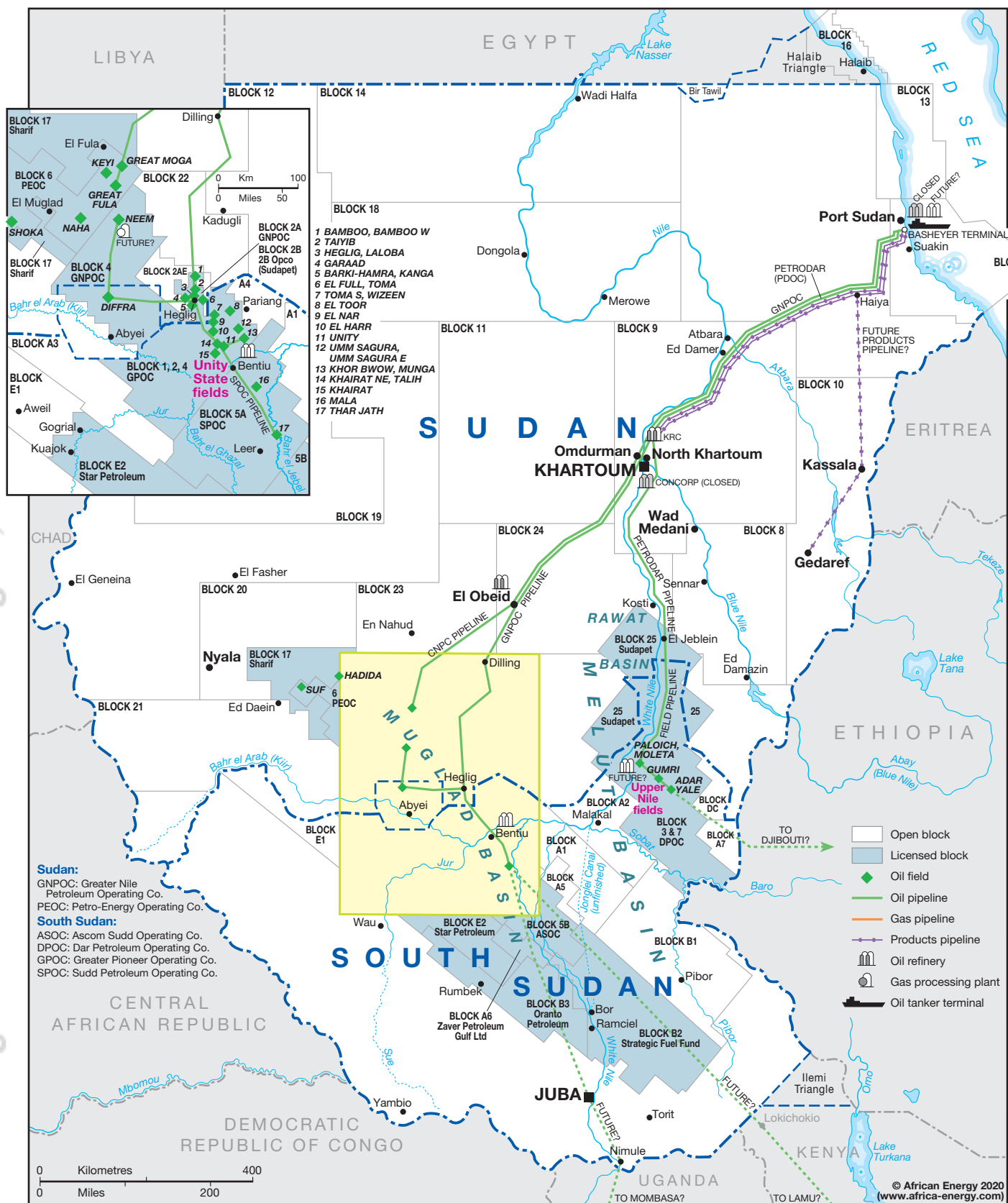


2018	Oil
Production	333,000 b/d
Proved reserves	1.6bn bbls

Source: BP Statistical Review of World Energy, June 2019



Sudan, South Sudan



	Oil, 2018	Sudan	South Sudan
Production		100,000 b/d	131,000 b/d
Proved reserves		1.5bn bbls	3.5bn bbls

Source: BP Statistical Review of World Energy, June 2019



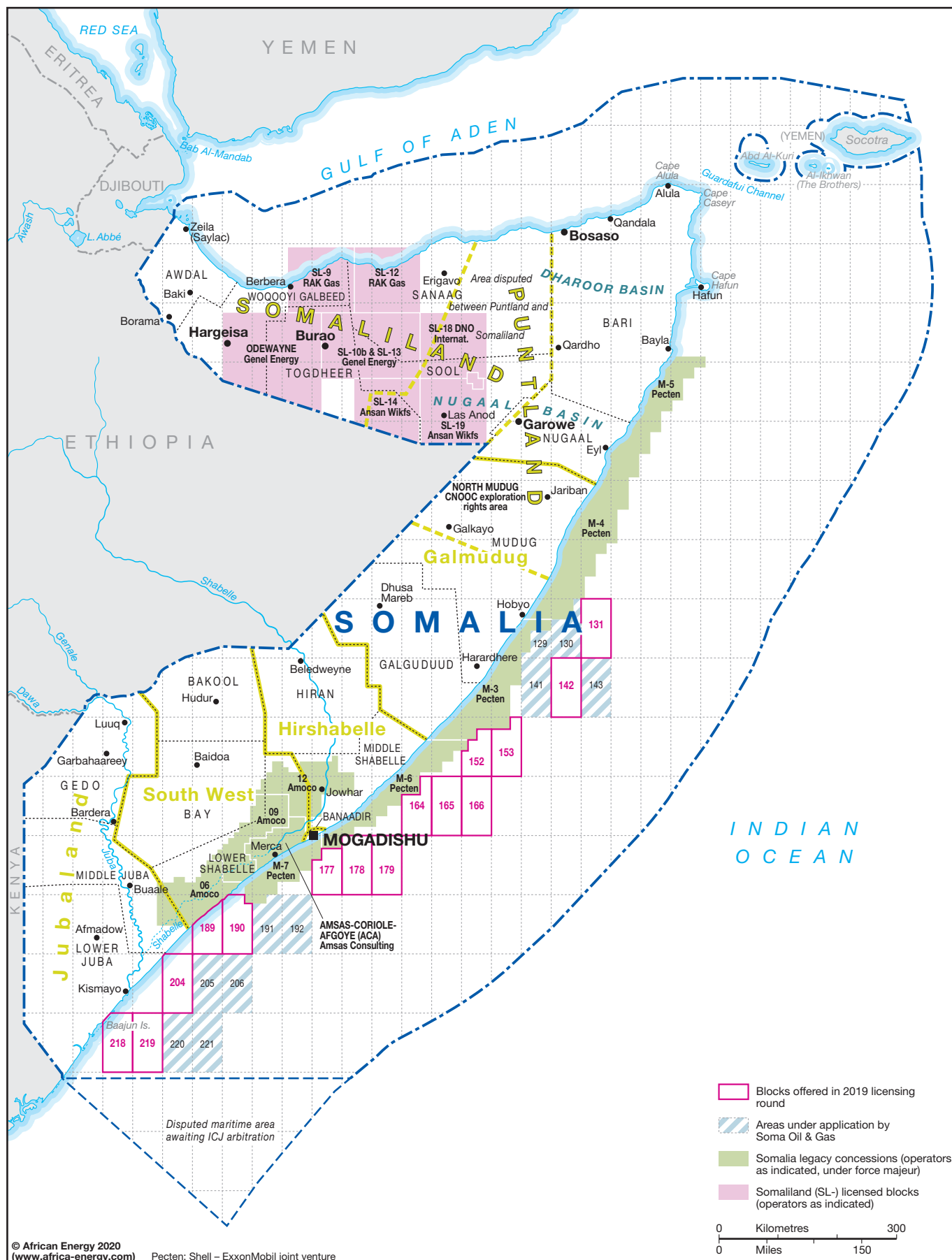
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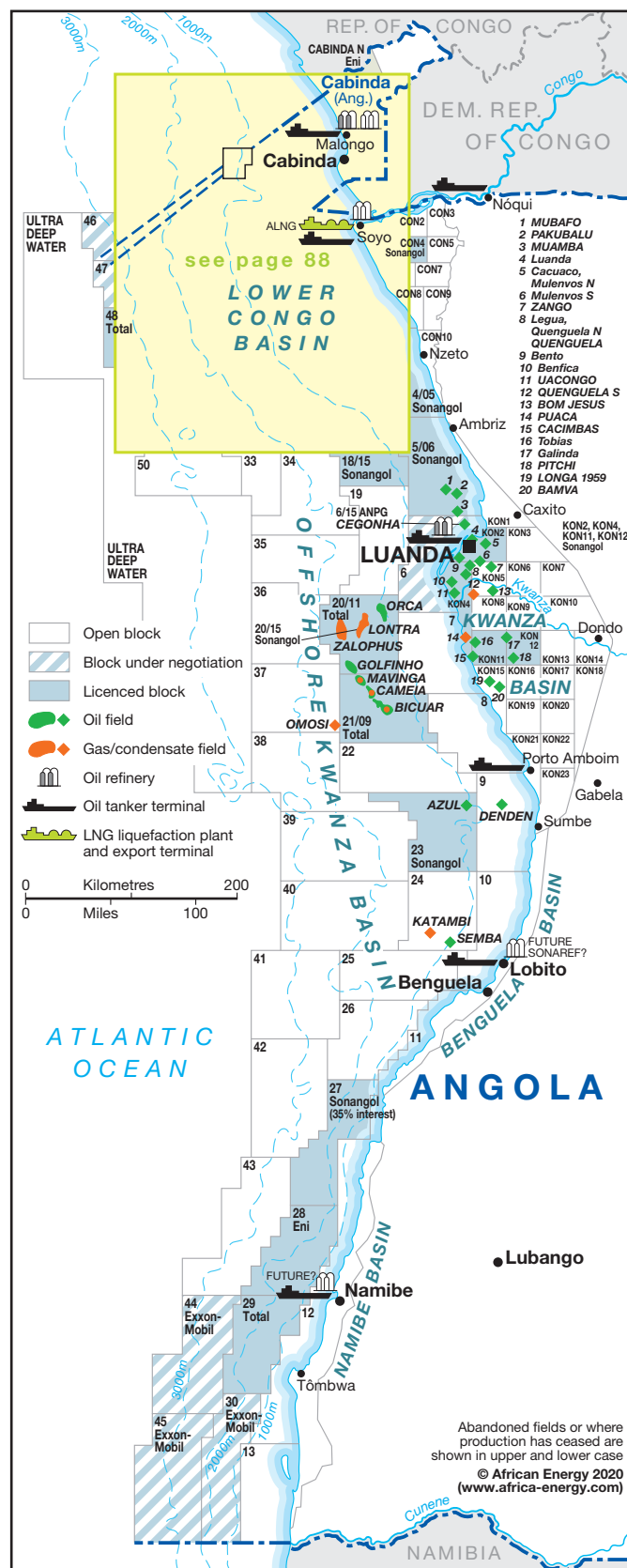
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Meetings

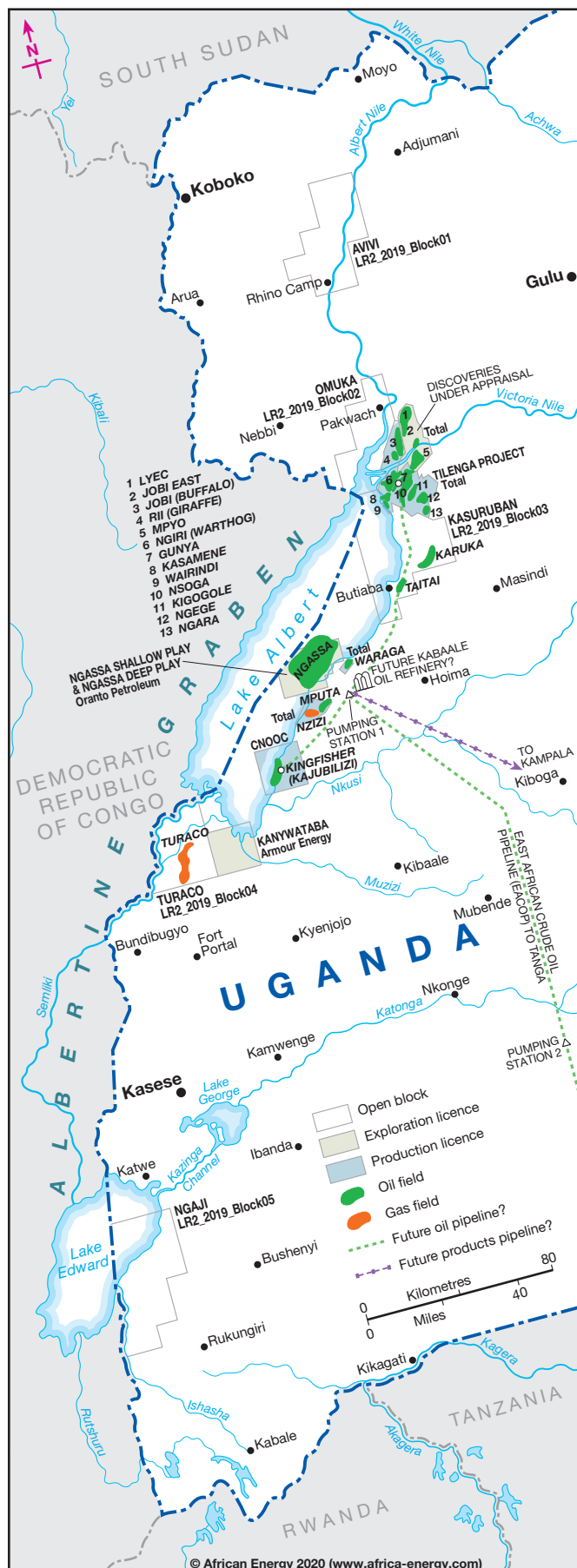


2018	Oil
Production	1.53m b/d
Proved reserves	8.4bn bbls

Source: BP Statistical Review of World Energy, June 2019



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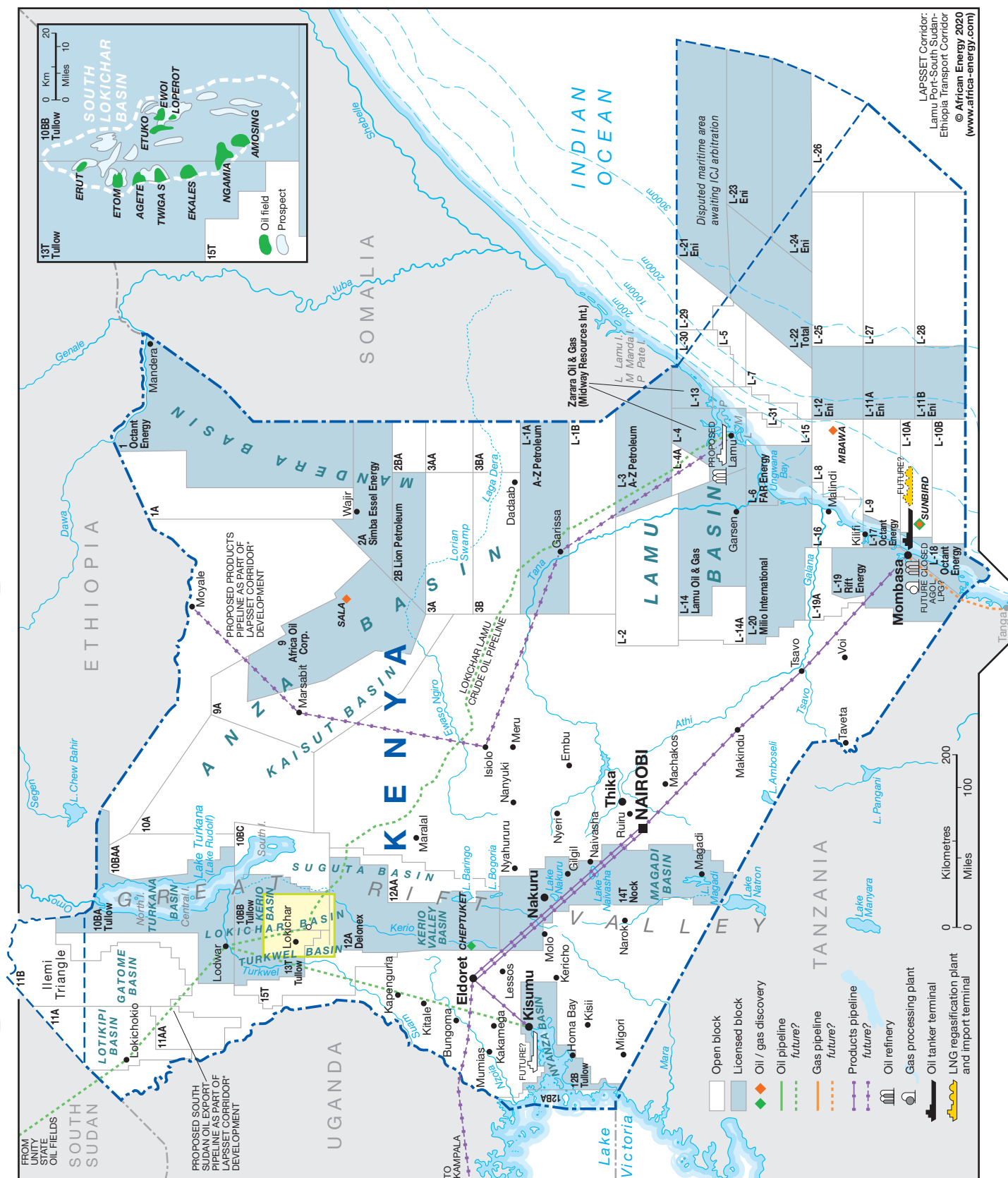
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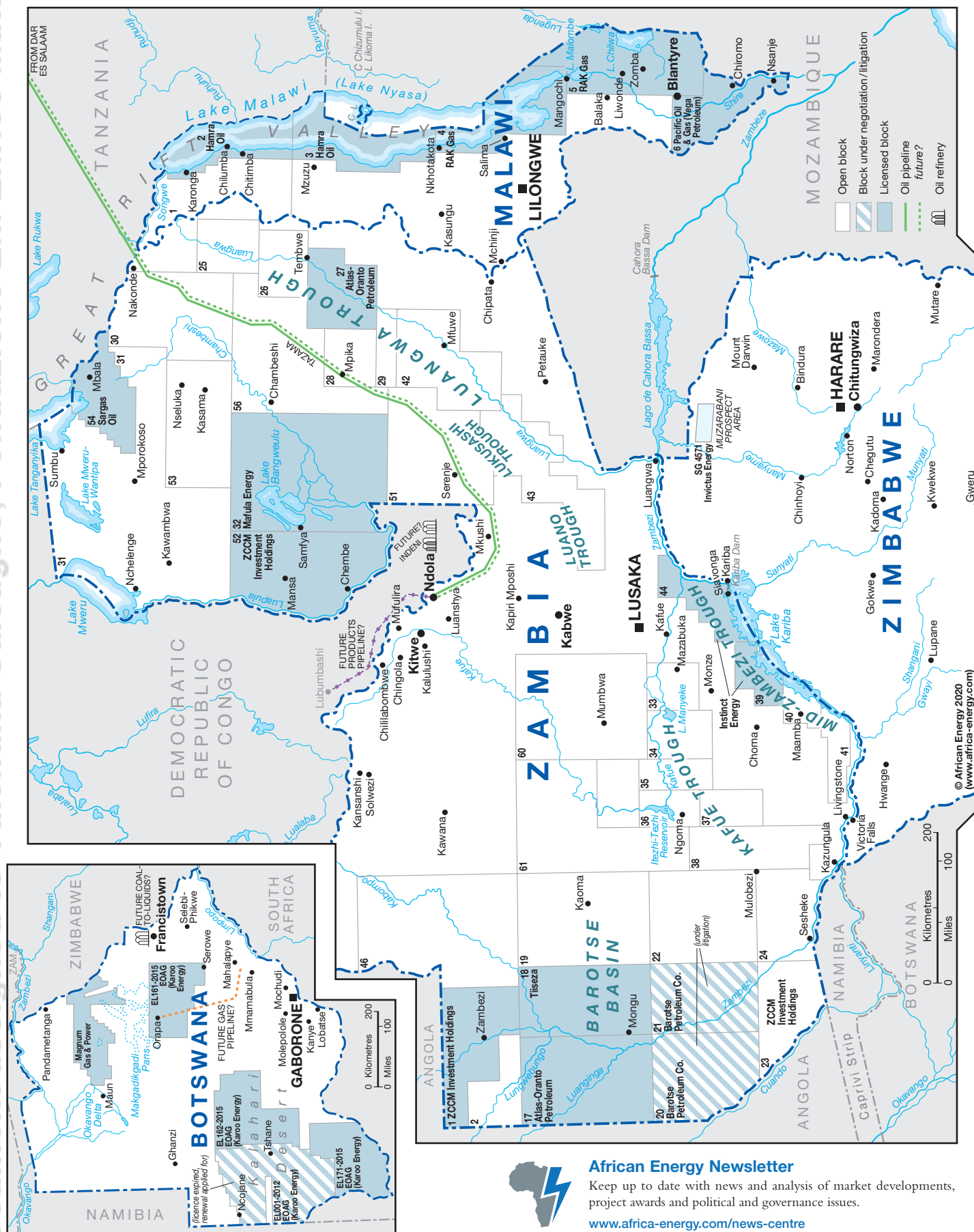
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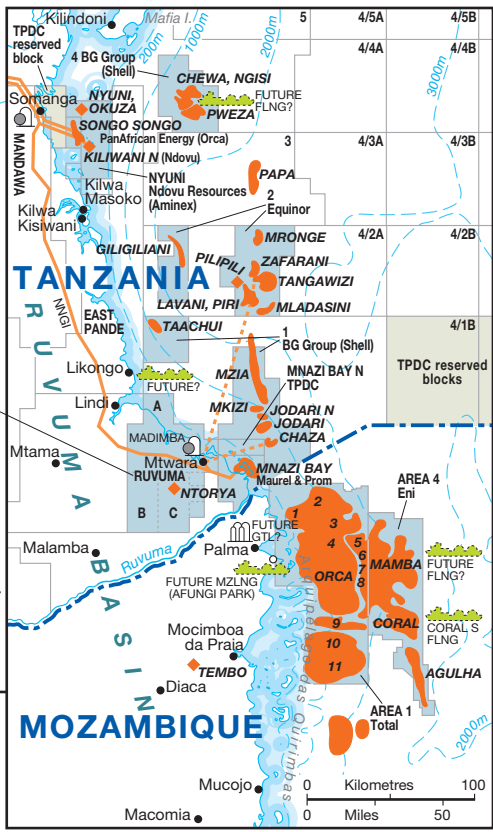


FLNG: floating liquefied natural gas

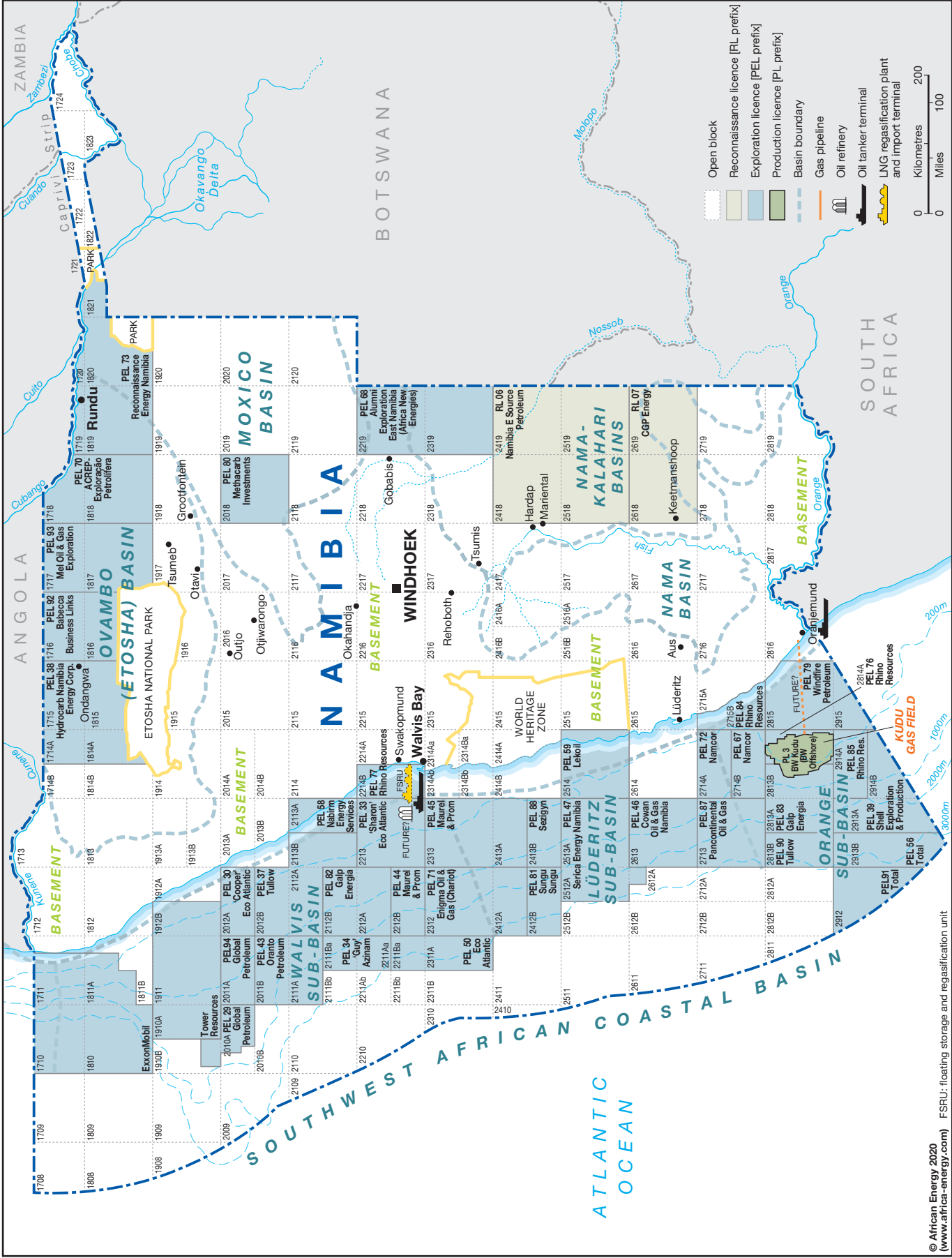


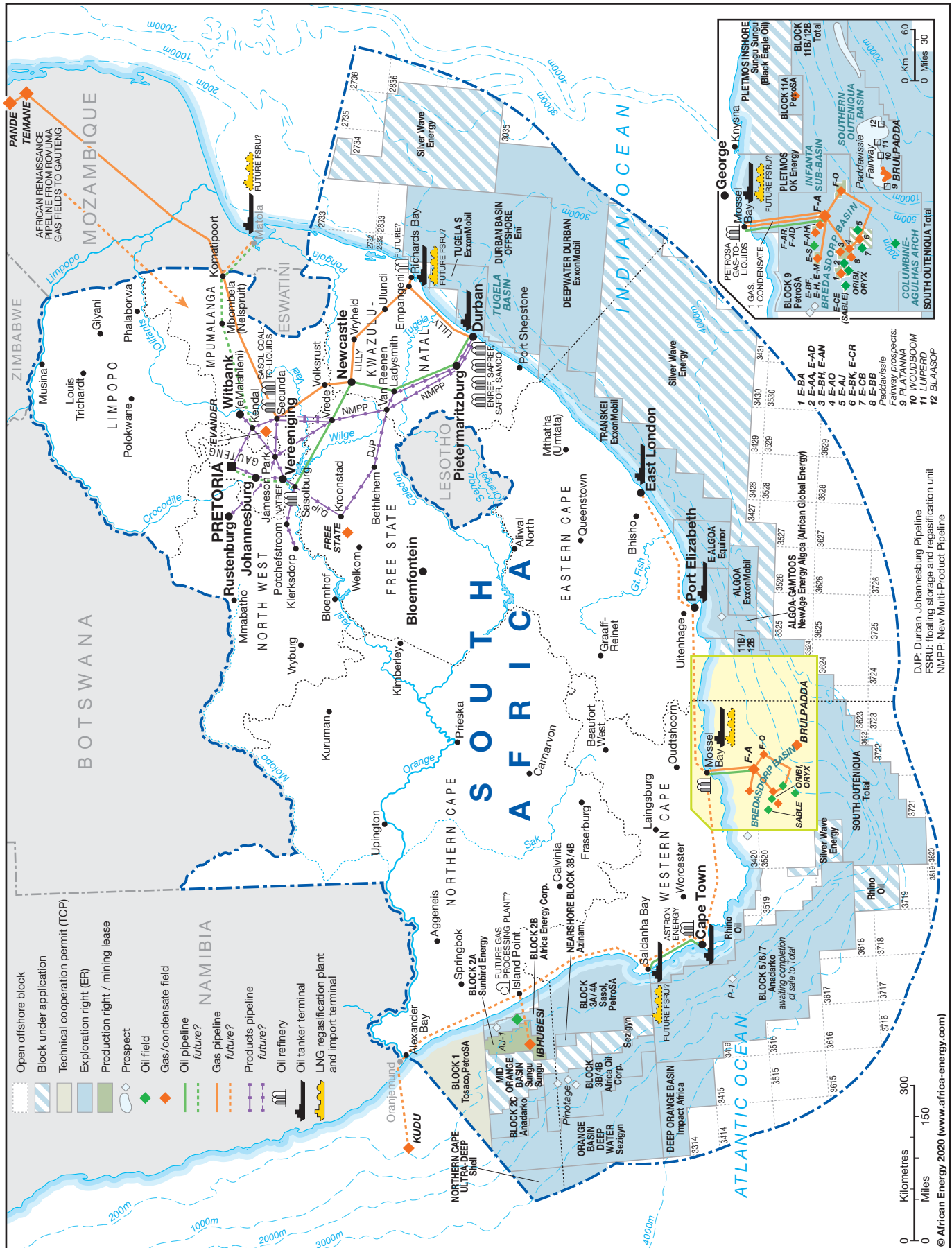
Zambia, Zimbabwe, Malawi, Botswana



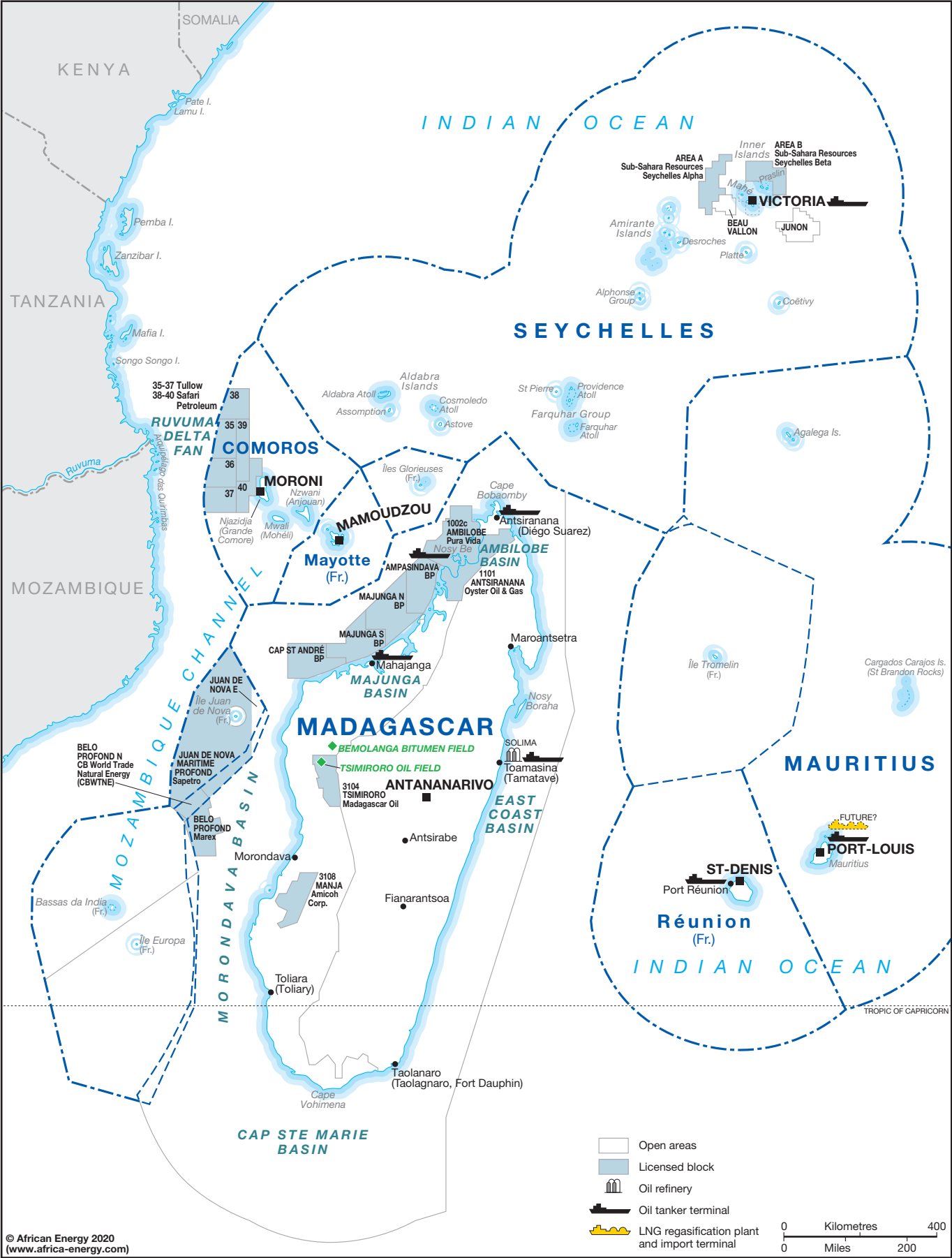


Namibia





Madagascar, Indian Ocean



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Progress on gas import schemes raises hopes for inter-African trade

Gas import schemes to supply industry and replace liquid fuels are making progress in several African states, though infrastructure remains a challenge. A number of countries are seeking to position themselves as regional hubs, raising hopes for development of inter-African gas trade

As interest grows in gas as a transition fuel, a number of states are continuing to look at importing LNG to fuel expansion of their power generation capacity, while countries with big offshore gas reserves are looking at options for domestic projects as well as big-ticket exports.

In one scheme with regional ambitions, Total signed a joint development agreement in November 2019 with South Africa's Gigajoule Energy and Matola Gas Company for a project to import LNG into Mozambique's Matola harbour, close to Maputo. Gas from a permanently moored floating storage and regasification unit (FSRU) would supply a power plant of up to 2GW at Matola, and would be piped into the South African gas pipeline network.

The project could potentially replace gas supply to South Africa from Mozambique's Pande and Temane fields, which are expected to start declining from 2023. Operator Sasol says it is considering all supply options, including the Matola project. While Mozambique is developing its own gas reserves, the planned LNG plant at Palma lies some 2,600km to the north and will be chiefly focused on export markets. A pipeline from Cabo Delgado to Maputo to join up with existing infrastructure has been proposed but there are questions about its viability.

Already South Africa's Mossel Bay gas-to-liquids plant is operating well below capacity due to the failure of a project to add more gas from the South African offshore. Coega has been identified as the location for an LNG import terminal, but minister of mineral and energy resources Gwede Mantashe has said South Africa could need more than one LNG complex, and Richards Bay has also been cited as a potential location.

Meanwhile, LPG is being looked at as a possible transition fuel for LNG, particularly in South Africa, where the largest LPG import terminal in the world has been built at Richards Bay. Various schemes are being assessed, including an unlikely plan to fuel the existing 1.3GW Ankerlig open-cycle gas turbine plant using LPG and more viable plans for a plant of around 100MW in the Richards Bay Industrial Development Zone. At least one company, PayGas, has begun supplying LPG as a cooking fuel in the Western Cape's poorest townships, with hopes the business model can be scaled across the country and wider region.

Equatorial Guinea is talking up its potential to become a regional gas supplier through its Gas Megahub project, which opens up the potential for monetisation of additional resources through existing infrastructure. The government is seeking new markets as the EGLNG plant's sales contracts expire, while

Noble Energy is seeking an outlet for 3tcf of discovered gas in the Douala Basin across Equatorial Guinea and Cameroon. A first stage harnessing gas from Noble's Alen field was agreed with Marathon Oil and the Ministry of Mines and Hydrocarbons in April 2019. The Fortuna gas field, awarded to Lukoil in the 2019 licensing round, is now also expected to supply EGLNG, after Ophir Energy's mooted floating LNG scheme failed to secure financing.

In Cameroon, Perenco is supplying gas to Africa's first floating LNG scheme offshore Kribi, and Victoria Oil & Gas is steadily expanding its gas supply network in the Douala region despite periodic payments difficulties with state utility Eneo. Gas from the long-stranded Etinde field in the Rio del Rey Basin could finally be harnessed under a letter of intent signed in February 2020 with operator New Age (African Global Energy). The project would involve building 60km of new pipeline from Limbé to Douala, opening up opportunities for gas supply along the route.

In Nigeria, following completion of a takeover by Savannah Petroleum, midstream supplier Accugas signed its first gas sales agreement in five years in February 2020. The company's new owners are confident that further expansion will follow. The agreement with Sahara Group affiliate First Independent Power Ltd to supply the Afam power plant is a fourth outlet for Accugas after the Calabar and Ibom Power plants and the Mfamosing cement plant. Savannah sees considerable potential for further expansion and expects further new gas sales agreements in the coming months. Wider expansion outside the south-east could come once the mooted East-West gas pipeline project is completed.

In North Africa, Egypt is attempting to grasp an opportunity to transform itself into a gas hub for the entire east Mediterranean region on the back of rebounding gas production. However, there are enormous geopolitical, commercial and policy barriers to turning that ambition into reality. Geopolitically, the biggest threat to the plan is Turkey, which is using its navy and its intervention in the Libyan civil war to stymie gas exploration offshore Cyprus and to undermine future pipeline developments.

Israeli gas is already being imported into Egypt via the East Mediterranean Gas pipeline. While the commercial details of this private-sector deal are unclear, it is hard to see how it can be cheaper than domestically produced gas, or how it can be re-exported from either the ELNG Idku or the Segas Damietta

liquefaction plants at internationally competitive prices. The other vital element of a functioning gas hub is a fully liberalised domestic market. Despite the establishment of the Gas Regulatory Authority in 2017, this is still a long way off. So far, it is still much cheaper for major gas consumers to buy gas from the government at fixed prices.

Algeria's gas exports to Europe have been squeezed by the availability of cheaper LNG. This has pushed Sonatrach to sell more LNG itself on the spot market. While total gas production has increased marginally in recent years, the commissioning of approximately 8GW of gas-fired power generation by 2021 is likely to reduce quantities available for export.

Having stepped back from plans to develop a large-scale integrated regasification and power generation project at Jorf Lasfar, Morocco has yet to fully clarify a new strategy. This may eventually involve FSRUs, but in the short term, the kingdom has taken the pragmatic decision to continue importing Algerian gas through the existing Maghreb-Europe Gas Pipeline. Meanwhile, Sound Energy plans a micro-LNG project at its Tendrara discovery, to supply gas to industrial customers. A more substantial pipeline development linked to power generation will take longer.

Another strategy that continues to capture the imagination of the gas industry is small-scale LNG, whether through a break-bulk hub and spokes development or LNG shuttling. While Greenville LNG in Nigeria has established a significant business, there is currently little movement towards similar schemes elsewhere. There are continued conversations in Kenya around an import scheme to convert existing thermal plants to gas, but these remain at a relatively early stage.

The International Finance Corporation continues to develop its project in Sierra Leone, but progress is slow and hampered by the difficulty of reaching demand in the region. Local private schemes show some promise but are mostly still to demonstrate both credible business models and access to sufficient capital.

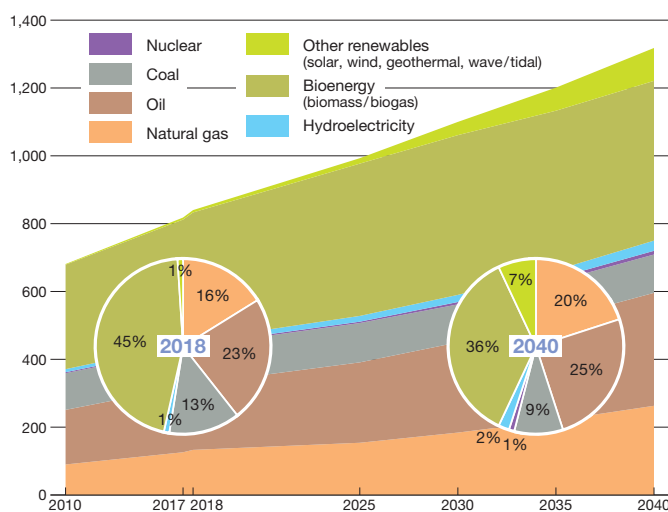
Refinery projects

In the liquid fuels sector, there are high hopes for business tycoon Aliko Dangote's 650,000 b/d refinery, which is close to completion in the Lekki Free Trade Zone in Lagos. The refinery is expected to start up in 2021, with the aim of meeting all Nigeria's refined petroleum products needs as well as exporting to neighbouring countries. Nigerian National Petroleum Corporation will supply crude to the refinery, enabling it to phase out its costly swaps programme for the direct sale of crude oil and direct purchase of refined products.

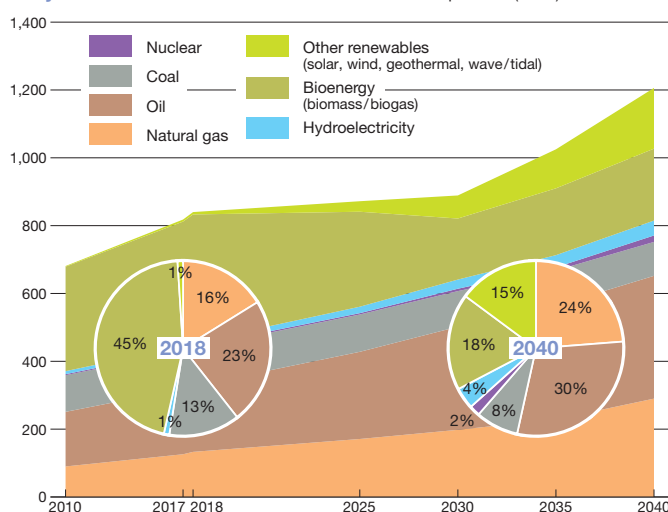
Angola's new government has laid out plans to increase oil refining capacity to 435,000 b/d by 2025 from just 75,000 b/d at present with the construction of three new refineries with private partners. These are a 60,000 b/d refinery in Cabinda and a 100,000 b/d refinery at Soyo, both in the far north, and the long-delayed two-phase 200,000 b/d Lobito refinery project in southern Benguela province. Sonangol and the Hong Kong-

TOTAL PRIMARY ENERGY DEMAND, 2010-40

Projections: IEA Stated Policies Scenario Million tonnes oil equivalent (mtoe)



Projections: IEA Africa Case Million tonnes oil equivalent (mtoe)



The **Stated Policies Scenario** reflects the IEA's measured assessment of today's policy frameworks and plans, taking into account the regulatory, institutional, infrastructure and financial circumstances that shape the prospects for their implementation.

The **Africa Case** is built on the premise of 2063, the continent's inclusive and sustainable vision for accelerated economic and industrial development adopted by African Union members in 2015. Faster economic expansion is accompanied by the full achievement of key Sustainable Development Goals by 2030. These include full access to electricity and clean cooking and a significant reduction in premature deaths related to pollution.

Source: International Energy Agency (IEA), *Africa Energy Outlook 2019* © African Energy 2020 (www.african-energy.com)

based United Shine consortium signed a deal in June 2019 to develop the Cabinda project, which is expected to cost \$2bn, partly financed by Russian bank VTB Group. Selection of a contractor for the Soyo scheme is also under way, but infrastructure investment may be delayed by sharply lower government income following the latest oil price crash.

In East Africa, Uganda's ambitions for a 60,000 b/d refinery to process crude from its Lake Albert fields are on hold along with the rest of the project due to a dispute with the government on the amount of tax payable on Tullow Oil's sale of part of its stakes in the upstream licences. Partner Total has also suspended preliminary work on the export pipeline project, and with oil prices plunging, development looks unlikely in the short to medium term.

Oil refineries, CTL and GTL plants

ALGERIA All refineries are government owned; operated by Sonatrach subsidiary Naftec except Adrar.

- 1 ● **ARZEW** • [1972], 90,000 b/d.
- 2 ● **TIARET** • 100,000 b/d refinery at design stage.
- 3 ● **ALGIERS** • Sidi R'cine (formerly El Harrach) [1964], 59,000 b/d; modernisation and expansion to 79,000 b/d completed in 2019 by China Petroleum Engineering and Construction Corporation (CPECC).
- 4 ● ● **SKIKDA** • [1980], 360,000 b/d. • Condensate refinery, 100,000 b/d.
- 5 ● ● **HAUD EL HAMRA, HASSI MESSAOUD** • HM I [1962] & HM II [1979], total combined capacity 27,000 b/d. • Second refinery to be built by Spanish-South Korean joint venture, 100,000 b/d by 2024.
- 6 ● **SBAA** • Adrar [2006], 13,000 b/d; operated by China National Petroleum Corporation (CNPC) in a 25-year concession.
- 7 ● **IN AMÉNAS** • [1980] 6,000 b/d; closed in 1986.

MOROCCO

- 1 ● **MOHAMMÉDIA** • Société Anonyme Marocaine de l'Industrie de Raffinage (Samir) – owned by Swedish-based Corral Petroleum [1959], 218,000 b/d, reduced to 178,000 b/d following closure of two old units; closed in 2015. Offered for sale.
- 2 ● **SIDI KACEM** • Société Chérifienne des Pétroles (SCP) [1940], 25,600 b/d; now closed, owned by Samir and used for storage.

MAURITANIA

- 1 ● **NOUADHIBOU** • Société Mauritanienne des Industries de Raffinage (Somir) [1982], 20,000 b/d; now closed.

SENEGAL

- 1 ● **M'BAO, DAKAR** • Société Africaine de Raffinage (SAR) [1963], 25,000 b/d; plans to increase capacity to 45,000 b/d
- 2 ● **BARGNY** • Proposed 100,000 b/d refinery.

NIGER

- **ZINDER** • Société de Raffinage de Zinder (Soraz) – China-Niger joint venture [2011], 20,000 b/d; managed by Société Nigérienne des Produits Pétroliers (Sonidep).

CHAD

- **DJERMAYA, N'DJAMENA** • China-Chad joint venture [2011], 20,000 b/d.

GUINEA

- **KAMSAR** • Proposed 12,000 b/d refinery and storage terminals; co-developers Africa Finance Corporation (AFC) and Brahms Oil Refineries Ltd.

SIERRA LEONE

- **FREETOWN** • Sierra Leone Petroleum Refining Company (SLRC) [1970], 10,000 b/d; closed in 1990 and now used for storage.

LIBERIA

- 1 ● **MONROVIA** • Liberia Petroleum Refining Company (LPRC), 15,000 b/d; mothballed in 1984, now operates as a storage depot.
- 2 ● **BUCHANAN** • 100,000 b/d refinery approved; Ecogas Refinery Liberia Ltd. (ERLL) – Liberian Investment Commission (LIC) joint venture.

CÔTE D'IVOIRE

- ● **VRIDI, ABIDJAN** • Société Ivoirienne de Raffinage (SIR) [1965], 84,000 b/d; expansion planned to more than double the capacity, financing secured from Africa Finance Corporation • Société Multinationale de Bitumes (SMB) [1978], 10,000 b/d.

GHANA

- 1 ● **TAKORADI** • Planned 150,000 b/d refinery.
- 2 ● ● **TEMA** • Tema Oil Refinery Company (TOR) [1963], 45,000 b/d but operating intermittently and at reduced capacity since a 2017 furnace explosion • Future 100,000-160,000 b/d refinery proposed to replace TOR refinery.

TOGO

- **LOMÉ** • Société Togolaise de Stockage (STSL) [1978]; refinery closed in 1981.

NIGERIA

All four Nigerian National Petroleum Corporation (NNPC) refineries to be fully rehabilitated after a long period of operating significantly below capacity, expected to be fully back on line in 2022.

- 1 ● **LEKKI FREE TRADE ZONE** • Refinery under construction since 2013 as part of petrochemicals and fertiliser complex developed by Dangote Industries [2021], with a capacity of 650,000 b/d it will Africa's biggest refinery.
- 2 ● **ESCRAVOS** • ECTL: gas-to-liquids plant – joint venture between Chevron Nigeria Ltd. (CNL) and NNPC [2014], 34,000 b/d.
- 3 ● **WARRI** • Warri Refinery & Petrochemical Company (WRPC) – owned by NNPC [1978], 125,000 b/d.
- 4 ● **OHAJI/EGBEMA** • 25,000 b/d Waltersmith modular refinery in Imo State, expected online during 2020 with initial 5,000 b/d capacity.
- 5 ● **KOLO CREEK** • 60,000 b/d modular refinery to be built by Rehoboth Natural Resources Development.
- 6 ● **NIGER DELTA** • 200,000 b/d refinery planned by Seplat Petroleum-NNPC joint venture.
- 7 ● **PORT HARCOURT** • Port Harcourt Refining Company (PHRC) – owned by NNPC, two refineries: PH I [1965, rebuilt 1989], 60,000 b/d; & PH II [1988], 150,000 b/d; now integrated.
- 8 ● **KADUNA** • Kaduna Refinery & Petrochemical Company (KRPC) – owned by NNPC [1980], 110,000 b/d.

CAMEROON

- **LIMBÉ** • Société Nationale de Raffinage (Sonara) [1977], capacity recently expanded to 72,000 b/d, but currently offline following a fire in May 2019. Rehabilitation likely to last until 2021.

TUNISIA

- 1 ● **BIZERTE** • Société Tunisienne des Industries de Raffinage (Stir) [1962], 34,000 b/d; expansion by 25% planned.
- 2 ● **LA SKHIRA** • Proposed 100,000 b/d refinery; change of location to Bizerte under consideration, plans currently on hold.

■ In operation ■ Future ■ Closed
[] Date of opening
Processing capacity shown in barrels per day

EQUATORIAL GUINEA

- 1 ● **PUNTA EUROPA** • New 20,000 b/d modular refinery planned.
- 2 ● **COGO** • New 20,000 b/d modular refinery planned.

GABON

- **PORT-GENITIL** • Société Gabonaise de Raffinage (Sogara) [1967], 24,000 b/d.

REPUBLIC OF CONGO (Brazzaville)

- **POINTE-NOIRE** • Congolaise de Raffinage (Coraf) [1976], 21,000 b/d.

DEMOCRATIC REPUBLIC OF CONGO

- **KINLAO, MUANDA** • Société Congo-Italienne de Raffinage (Socir) [1963], 15,000 b/d; not operating since 2000.

ANGOLA

- 1 ● ● **CABINDA** • Cabinda Gulf Oil Company (Cabgoc), a subsidiary of Chevron, 12,500 b/d • Second refinery (60,000 b/d) under construction, initially beginning with 30,000 b/d in 2021.
- 2 ● **SOYO** • New 100,000 b/d refinery planned, with expectations of completion by 2023/24.
- 3 ● **LUANDA** • Previously operated by Total, now by Sonangol [1958], 57,000 b/d; expanding to 102,500 b/d by mid-2021.
- 4 ● **LOBITO** • Construction of 200,000 b/d Sonaref refinery began in 2012, but suspended since 2016 – owner and developer is state-owned Sociedade Nacional de Combustíveis de Angola (Sonangol). Sonaref now looking to resume construction and complete by 2025.
- 5 ● **NAMIBE** • 400,000 b/d Namref refinery planned – Russia's Rail Standard Service and Fortland Consulting Company.

LIBYA All refineries government owned (NOC).

- 1 ● **ZAWIYA** • Azzawiya Oil Refining Company (ARC) [1974], 120,000 b/d; output frequently disrupted.
- 2 ● **RAS LANUF** • Ras Lanuf Oil & Gas Processing Company (Rasco) [1984], 220,000 b/d; closed in 2011.
- 3 ● **MARSA AL-BREGA** • Sirte Oil Company [1970], 10,000 b/d.
- 4 ● **TOBRUK** • Arabian Gulf Oil Company (Agoco) [1985], 20,000 b/d.
- 5 ● **SARIR** • Agoco [1986], 10,000 b/d.

EGYPT All refineries government owned (EGPC) & operated through subsidiaries except ERC at Mostorod.

- 1 ● ● ● **ALEXANDRIA** • El Mex Refinery – Alexandria Petroleum Company (APC) [1957], 115,000 b/d • Alexandria Mineral Oils Company (AMOC) [2002], 34,700 b/d • Alexandria National Refining and Petrochemical Company (ANRPC) [2013] 18,500 b/d; expansion to 23,000 b/d.
- 2 ● ● **AMERIYA FREE ZONE** • Middle East Oil Refinery (Midor) [2001], 115,000 b/d; modernisation and expansion to 160,000 b/d by 2022 • Ameriya Petroleum Refining Company (APRC) [1972], 78,000 b/d.
- 3 ● **TANTA** • Cairo Oil Refining Company (CORC) [1969], 35,000 b/d.
- 4 ● ● **MOSTOROD PETROLEUM COMPLEX (MPL), CAIRO** • Cairo Oil Refining Company (CORC) [1973], 145,000 b/d • Egyptian Refining Company (ERC), a subsidiary of private equity company Citadel Capital [2019], 100,000 b/d.
- 5 ● ● **SUEZ** • El Nasr Petroleum Company (NPC) [1913], 146,000 b/d • Suez Oil Processing Company (SOPC) [1921], 68,000 b/d.
- 6 ● **WADI FEIRAN** • El Nasr Petroleum Company (NPC), 9,000 b/d.
- 7 ● **ASYUT** • Assiut Oil Refining Company (ASORC) [1987], 60,000 b/d; upgrade underway for completion in 2020.

SUDAN

- 1 ● ● **PORT SUDAN** • Port Sudan Petroleum Refinery – government owned [1964], 21,700 b/d; closed in 2013 and now decommissioned • New 200,000 b/d Red Sea Coast refinery planned, construction by Russian state-owned Rosgeologia.
- 2 ● ● **KHARTOUM** • Concorc Refinery at Al-Shajara [1999], 10,000 b/d; not currently operating • Sudan Khartoum Refinery Company (KRC) – China-Sudan joint venture, at El Gily [2000], 100,000 b/d; expansion to 200,000 b/d planned.
- 3 ● **EL OBEID** • [1996], 10,000 b/d – Sudapet.
- 4 ● **ABU GABRA** • [1992], 2,000 b/d, closed in 2006.

SOUTH SUDAN

- 1 ● **THANGRIAL** • 10,000 b/d construction suspended due to conflict – Ventech Engineers International. The Paloich oil hub was also the subject of a 2019 proposal from local company Trinity Energy, for a 40,000 b/d refinery.
- 2 ● **BENTIU** • Safinat Caspian Oil Refining Company, initial capacity 7,000 b/d; damaged during military action but restoration work began in December 2018. Plans to increase capacity to 25,000 b/d.

ERITREA

- **ASSAB** • Soviet-built refinery [1967], 17,500 b/d; closed in 1997.

DJIBOUTI

- **DORALE, DJIBOUTI VILLE** • 100,000 b/d refinery planned.

UGANDA

- **KABAAL** • 60,000 b/d refinery planned for Lake Albert oil to be built and operated by Albertine Graben Refinery Consortium (AGRC).

SOMALIA

- **JASIIRA** • Iraqsoma Refinery Corporation – Somali government owned, 10,000 b/d; closed in 1990.

KENYA

- 1 ● **LAMU** • Refinery proposed as part of the Lamu Port-South Sudan-Ethiopia Transport (LAPSSET) Corridor infrastructure project. Alternative location of Mombasa also under consideration.
- 2 ● **CHANGAMWE, MOMBASA** • Kenya Petroleum Refineries Ltd. (KPRL) [I: 1963 & II: 1974], 60,000 b/d; closed in 2013. Now a storage facility, currently leased to Kenya Pipeline Company (KPC) and used as a shipping hub receiving Lokichar oil by tanker.

TANZANIA

- 1 ● **BAGAMOYO** • Heavy oil refinery – Kamal Group.
- 2 ● **DAR ES SALAAM** • Tanzanian and Italian Petroleum Refining Company (Tiper) [1969], 17,000 b/d; closed in 2000, now used as a storage facility by Oryx Energies.

ZAMBIA

- ● **NDOLA** • Government-owned Indeni Petroleum Refinery Company (IPRC) [1973], 24,000 b/d; recent upgrades have boosted production – now the government is selling the plant • A consortium of Russian investors are planning on building a new \$4bn refinery and boosting capacity of the Tazama pipeline.

MADAGASCAR

- **TOAMASINA** • Solitary Malagasy (Solima) refinery, 15,000 b/d; closed in 2004.

MOZAMBIQUE

- 1 ● **PALMA** • Shell has agreed to build a 38,000 b/d gas-to-liquids (GTL) plant.
- 2 ● **MATOLA** • Refinery presently inactive.

ZIMBABWE

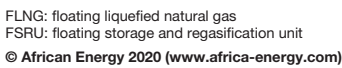
- **MUTARE** • Feruka [1965], 10,000 b/d; mothballed after less than a year.

SOUTH AFRICA

- 1 ● **COALBROOK, SASOLBURG** • National Petroleum Refiners of South Africa (Natref) – Sasol-Total joint venture [1971], 105,000 b/d.
- 2 ● **SECUNDA** • Coal-to-liquids (CTL) plant; Sasol owns and operates Sasol 2 [1980] and Sasol 3 [1984], total 150,000 b/d; conversion to GTL by 2024. CTL pilot Sasol 1 was built at Sasolburg in 1955.
- 3 ● **RICHARDS BAY** • South Africa's Central Energy Fund-Saudi Aramco joint venture proposing a 300,000 b/d refinery by 2028.
- 4 ● ● ● ● **DURBAN** • Enref – Engen Petroleum, owned by Petronas [1954], 150,000 b/d • Sapref – BP-Shell joint venture at Prospecton [1963], 180,000 b/d • Safor lube oil refinery • Samco lube oil refinery.
- 5 ● **COEGA INDUSTRIAL DEVELOPMENT ZONE, PORT ELIZABETH** • Project Mthombo – PetroSA-Sinopec joint venture, 300,000 b/d.
- 6 ● **MOSSEL BAY** • World's first gas-to-liquids (GTL) refinery – PetroSA [1992], 45,000 b/d crude equivalent; supplied with gas from offshore Bredasdorp Basin. Formerly known as Mossref and Mossgas.
- 7 ● **MILNERTON, CAPE TOWN** • Astron Energy, former Chevron refinery [1966], 110,000 b/d.

BOTSWANA

- **FRANCISTOWN** • Project Tsosoloso includes a 20,000 b/d coal-to-liquids (CTL) plant, eventually 50,000 b/d – Coal Petroleum (Pty) Ltd.



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